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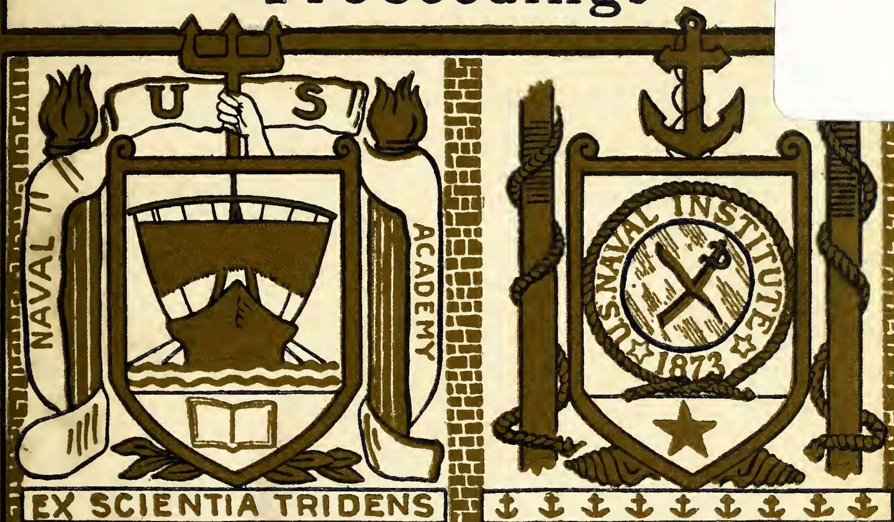

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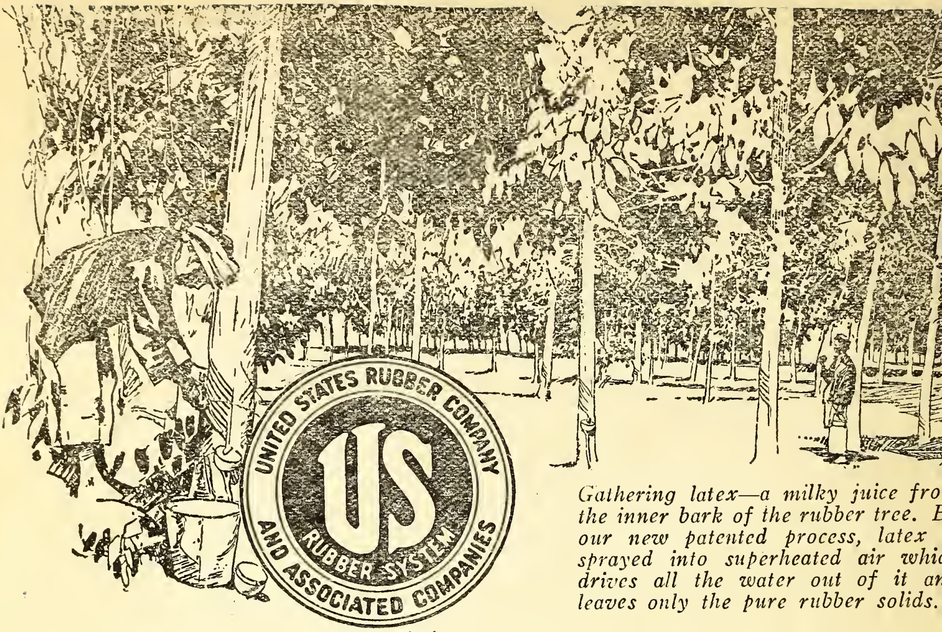

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United States Naval Institute Proceedings

September, 1923

Edited by H. G. S. Wallace

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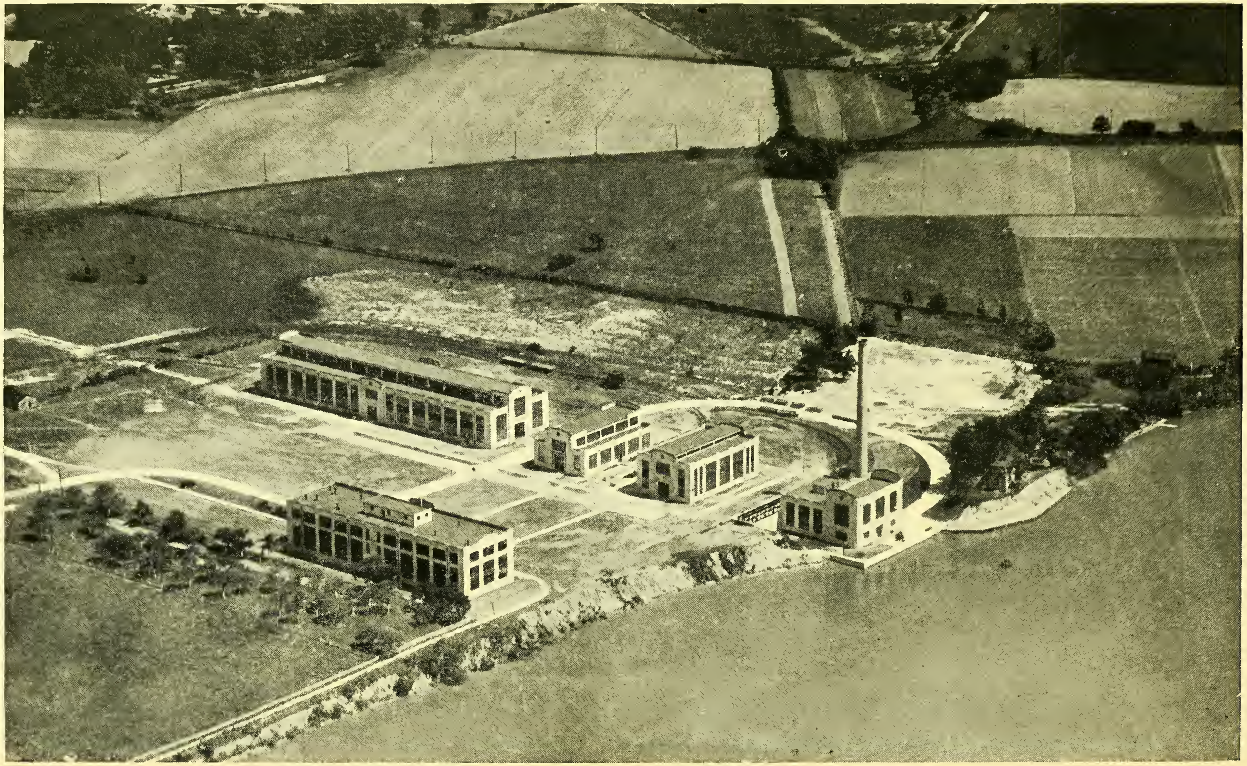

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THE DEVELOPMENT OF AVIATION IN THE FLEET

By Lieutenant DeWitt C. Ramsey, U. S. Navy

COINCIDENT with the projected plan of the Navy Department to provide all capital ships with observation, torpedo carrying and combat aircraft, and cruisers, destroyers and submarines with observation planes, it appears desirable that officers of the Navy whose professional leanings have favored the study of the development of any of the above types of combatant surface craft should visualize the effect of the innovation of these comparatively new auxiliaries, destined undoubtedly to exercise such a potent influence upon naval warfare of the future. The history of the development and the functions, limitations and potentialities of the various other types of aircraft adaptable to naval needs, however, should be clearly understood by all officers of high rank in the service to whom units composed of such types may be assigned, for operation purposes, to insure the proper and timely allocation of these weapons to naval tasks.

It is an unfortunate truth that the circumstances of the development of naval aircraft and the training of our aviation personnel before and during the war 1914-18 were such that the Navy at large was kept but poorly informed of the progress made in naval aeronautics. The segregation and isolation of aviation units imposed by the conditions of the war tended materially to retard the establishment of aviation in its proper place in the fleet.

The termination of hostilities found the aviation arm of the Navy, while skilled and experienced in convoy and anti-submarine

patrol operations conducted from aviation bases ashore, in no measure fitted or in the slightest manner prepared to move with, operate with, or serve the fleet. It is little wonder that many logical arguments in favor of a united Air Service were advanced at that time but it is to be hoped that the development of mobility in naval aviation units, the judicious choice of equipment best fitted to fulfil naval aviation requirements, and the positive identification of aviators in the Navy with the parent service—not as airmen, but as naval flying officers, will definitely convince the press, the public and the aircraft industry of the United States, of the right of the Navy to maintain and retain intact its own flying service.

It will be remembered that the conclusion of the war found the active war service United States Naval Aviation personnel located in fifteen air stations of permanent construction in France, five in Ireland, two in England, three in Italy, and one in the Azores. With the exceptions of the units operating from St. Inglevert in France and Eastleigh in England (which were assigned day and night missions of bombing the German bases at Bruges, Zeebrugge and Ostend, with land machines), practically all heavier than air equipment supplied consisted of flying boats of American, British, French or Italian origin, designed primarily for submarine patrols and capable in some circumstances of bombing localities where active aerial opposition and efficient anti-aircraft fire were not encountered. (This applied particularly to the units stationed in Italy.) Aerial submarine patrol and convoy work was neither highly educational nor interesting, and its greatest compensation to aviators engaged in those activities was the return, after an arduous and ofttimes apparently futile flight, to an air station the appointments of which from a standpoint of comfort and convenience left little to be desired. It is not suggested that the establishment of the bases above referred to was an error in policy, or that the hundreds of thousands of miles of aerial patrols carried out by our fliers off English, French and Irish coasts were void of accomplishment. On the contrary war records prove that several German *U* boats were destroyed by United States naval aviators, and the mere presence of aircraft in the operating zone of hostile submarines tended to curtail and embarrass their commerce destroying activities. The object of

this digression is merely to set forth clearly the influence which surrounded our flying personnel during the war, and to accentuate the importance of drawing into the fold, renewing the interest, and reeducating our flying contingent in the mission of the Navy, the school of the ship and the service of the sea.

The destruction by burning of a considerable number of *HS-2* flying boats at the Naval Air Station at Brest during the armistice, after unsuccessful efforts had been made to dispose of those craft to foreign governments, marked the beginning of a new era in the development of our Naval Air Service. It was realized that the cost incidental to the reshipping of the hulls of the machines to the United States and their subsequent maintenance in preservation in storage would necessitate an expenditure of funds which could be more judiciously invested in experimentation with other types of aircraft and aircraft appliances. Accordingly a number of Sopwith and Nieuport single seater pursuit planes were purchased from the British and French Governments and later installed on platforms mounted on the turrets of our capital ships. The history of the experimentation in the fleet with those and the subsequent types of planes of American manufacture is perhaps well known to most naval officers. Suffice to say that successful launchings, owing to the short length of platforms, necessitated courses of the carrying vessels directly into the wind, a tactical restriction not always agreeable to the commander-in-chief. The location of machines on the forward turrets, according to reports of the commanding officers, interfered frequently with the conning of the ship. Finally, it was quite definitely established that the pilot of a single-seater airplane, speculating quite often on the eventualities of a forced landing at sea without flotation gear, engaged in the multitudinous duties of maintaining position, operating controls, observing fall of shot, sending and receiving radio, and occasionally maneuvering to avoid collision with other distracted pilots engaged in the same task, could hardly be expected, in the circumstances, to perform any one of those duties with efficiency.

In conjunction with this fleet aviation project there was formed immediately after the war the Atlantic Fleet Air Boat Squadron which, for the last four years, has accompanied the Atlantic and Scouting Fleets on their annual southern cruise. It is believed

that the affiliation of that unit with the other forces of the fleet has been of great mutual benefit to the aviation operating personnel and to ships' officers; the former through a better understanding of the primary mission of the fleet and its subordinate units, and the latter through a general education in and understanding of fleet aviation operations, attained by proximity to and intimate liaison with an operating air squadron. It is deemed appropriate at this point to invite attention to the only type of aircraft in use in the United States Navy which has demonstrated its capability of extended cruising with the fleet. This type, the *F-5-L,* a development of the original Felixstowe flying boat, has, without doubt, been used more extensively by the United States and British Governments for oversea patrol, scouting and reconnaissance than any other type of flying boat or seaplane in the world. Its staunch build and rugged seaworthy qualities especially recommend it for such service. While it is realized that aerial spotting operations conducted from such a craft are highly artificial, owing to its limited ceiling and vulnerability to single seater fighter attack, its value as a medium by which the development of a suitable aviation spotting doctrine for the fleet may be carried on, should not be underestimated.

During the winters of 1919-20 and 1920-21 the Atlantic Fleet Kite Balloon Squadron, ordinarily based at the Naval Air Station, Hampton Roads, was transferred to Guantanamo and established at Fisherman's Point, from which base occasional exercises were conducted with battleships of the fleet. These activities were abruptly suspended in March, 1921 by the commander-in-chief following a disastrous morning's operations, resulting in the loss of two balloons, two deaths and numerous injuries to the flying personnel. Lack of experience in design and operation undoubtedly has been responsible for the unsatisfactory progress made with the kite balloons and while, at the present time, their development is virtually at a standstill, it is possible that experimentation will be renewed.

In the winter of 1917 there came into existence the Naval Air Station at San Diego which has lately become the site for the development of aerial combat, observation, and torpedo plane doctrine for the battle fleet based at San Pedro. Combat and observation work is carried on entirely in land machines and

operations are conducted from an extensive aerodrome on North Island. Excellent work shops and repair facilities are available and flight conditions may be said to be close to the ideal. However, the unsatisfactory features of operation from such a base, with the character of equipment provided are obvious, and it is realized that, in particular, the development of spotting planes provided with flotation gear, which will eventually form an integral part of the capital ship's gunnery department, should be pressed with the utmost vigor.

The torpedo plane squadrons based on the Atlantic and Pacific coasts have had, as yet, little opportunity to exercise with the fleet. It has been found necessary in the development of this activity continuously to modify and improve the seaplanes provided for torpedo carrying, and until a type suitable to the peculiar requirements of torpedo plane attack is developed, it is to the best interests that co-operative effort be subordinated to concentration within the squadrons on the problem of the selection of material best suited for the service assigned.

Progressing to the agency provided on our capital ships for the launching of aircraft, to date catapults have been installed on the *Maryland, Oklahoma, Nevada* and *Langley,* and as previously stated it is the policy of the Department similarly to equip practically all types of fighting vessels.

Successful launchings of two seater spotting seaplanes have been made from the battleships, and a lightly loaded torpedo plane has been catapulted from the deck of the *Langley.* The immediate problem in catapult design is the development of an installation capable of launching, at the necessary flying speed, machines of at least six thousand pounds weight accommodating, in the case of the projected fleet spotting machines, three men. Present battleship installations in which the projection is accomplished by compressed air charges, are capable of handling weights up to approximately three thousand pounds and insure adequate flying speed for machines of that weight at the end of a sixty-foot run. The substitution of powder charges for compressed air with provision made for a slightly greater length of run and higher acceleration should provide our aircraft carrying vessels with the means of launching satisfactorily all types of planes which can be carried on board.

While the turn-table catapult installed on the quarter deck permits a wide arc of train for firing, both underway and at anchor, its height above the deck complicates the handling of machines on board, and its use entails the necessity of unrigging and rerigging stanchions, flag staff and the boom provided for hoisting planes in after flight. This process is laborious in the extreme, and in general has not tended to popularize catapult installations on capital ships. The Department is fully aware of this situation, and it is understood that a modified design of catapult, either mounted on the after high turret, or embodying the features of the *Langley* installation, is contemplated. It is believed that the location of a catapult track on the forecastle, with all operating mechanism housed below decks, would be a satisfactory compromise.

In March, 1923 the aircraft carrier *Langley* temporarily joined the United States Fleet in Panama Bay, where flying demonstrations were conducted for the benefit of the officers of the fleet. Take-offs from the flying deck, and landings thereon, were accomplished with a facility and skill which clearly reflected the perfection of training of the pilots and the efficiency of the arresting devices employed. To those officers of the *Langley* concerned with the experimental flying operations now being carried on, a grateful debt is due for their indefatigable industry and energy, which have so freely and fearlessly been devoted to the solution of problems bearing so vitally on the commissioning of our new carriers.

Under the headings of types of aircraft previously referred to, now will be discussed the military defensive and offensive potentialities inherent in such types, their limits of usefulness as auxiliaries to various types of naval surface vessels and suggested methods of their employment in naval warfare. In this discussion will be included a brief discourse on the subject of lighter-than-air craft now under construction for the United States Navy, and the uses to which the finished products may be put.

Scouting Planes

Aircraft adaptable to long distance scouting flights over the sea are so designed as to favor the following characteristics:

(a) Reliability of power plant.
(b) Multiplicity of power units.
(c) Good visibility.
(d) Ease of control.
(e) Large fuel capacity.
(f) Reliable and powerful radio equipment.
(g) Seaworthiness.

Two types of naval aircraft have been developed in recent years which embody to a satisfactory degree many of the above qualities, namely the *F-5-L* and the *N. C.* Of the two the *F-5-L* better answers the requirements of a fleet scouting plane, for the reasons of greater economy in construction and operation, better facilities of handling, and load carrying capacity more appropriate to the nature of service required. While the *NC's 1, 3* and *4* demonstrated the extensive cruising radius of the type in the Trans-Atlantic flight from Halifax to the Azores, scouting operations over the sea of one-half such a distance from a base should be assigned aviation units only in circumstances of the gravest urgency. The complexities of maintaining communication, variable wind and weather conditions encountered in flight, lack of meteorological information and difficulties of establishing position, would all militate against the success of such an expedition. It is believed, therefore, that the *F-5-L,* with a scouting radius of at least 250 miles, to which may be added the range of visibility from the altitude of flight, provides the most satisfactory existing agency for the carrying on of aerial scouting operations for the fleet.

No provision can be made to carry machines of the long distance scouting class, in a condition ready for flight, on vessels of the fleet. Their contiguity to the fleet may be maintained by the assignment, to the aviation units of which they form a part, of mother ships, especially fitted and appointed with the necessary repair, overhaul and work shop facilities and gasoline storage accommodations. If extended cruising is contemplated along coasts where facilities do not exist for the hauling out of the

planes, seaplane lighters should be provided whenever practicable.

A portion of the load of the fleet aerial scout necessarily must be given up to gunnery equipment. *F-5-Ls* on a war scouting mission, the carrying out of which may bring them in contact with machines of the combat type, should carry at least four machine guns covering every practicable area of fire. While this, at first sight, may seem to be an unnecessary formidable battery and an injudicious expenditure of useful load, it must be realized that maneuvering ability and performance have been sacrificed to the attainment of the essential scouting qualities. The morale of the flying personnel should not be forgotten in any circumstances of the planning of aviation operations.

The development of an aviation scouting doctrine in the fleet has lead to the adoption of the principle of the assignment of two or more planes to any one scouting mission. To insure mutual protection in the event of attack by combat planes, and assistance in the eventualities of forced landings, it is believed that this policy should hold in war-time operations.

Scouting planes may at times perform the functions of bombers, spotting, photographic, patrol and general utility planes. In time of war, however, bombing and spotting activities could only be carried on successfully against enemy forces unaccompanied by aerial combat squadrons, and most inadequately equipped with anti-aircraft batteries.

The existing types of fleet aviation scouts cannot operate successfully away from the coast and protected waters for a greater period than their sustained flight endurance. This limitation should always be borne in mind by those officers of the service concerned with their employment.

Bombing Planes

Bombing planes operating with naval forces may be assigned any one of the following missions:

(a) Bombing of capital ships.
(b) Bombing of aircraft carriers.
(c) Bombing of submarines.
(d) Bombing of fortifications and defended establishments ashore.

Combat Planes

It is essential that the fleet combat planes have the following characteristics:

(a) Single seat.
(b) Small wing area.
(c) High horsepower (single power unit).
(d) High speed and ceiling.
(e) Great maneuverability.
(f) Two fixed synochronized machine guns.
(g) Land chassis.
(h) Air bag flotation.

Too much importance cannot be given the availability of machines of the combat type to the commander-in-chief prior to and during a fleet engagement. Victory or defeat in future naval battles may easily depend upon control, or lack of control, of the air. Every facility or agency, therefore, for conveying combat planes to the scene of conflict should be utilized to its maximum capacity.

In the design of the satisfactory combat plane it is obvious that the attainment of high performance is the primary requisite. Every additional feature is subordinate to the ability of the adopted type to out-maneuver, out-climb and out-fly in miles per hour the best the enemy can put in the air. Seaworthiness must necessarily be sacrificed and the only flotation provided be in the form of air bags so installed in the afterbody as not to affect the stream line characteristics of the machine. It is possible that a retractable chassis may be adopted for fleet planes of the combat type or, as a compromise, a chassis which may be released once the plane has taken the air. Any measure which will enhance maneuverability or performance in this field of work must be given consideration.

The mission to which naval combat machines may be assigned are listed below in what is considered to be their order of importance.

(a) Pursuit and attack of hostile observation planes.
(b) Pursuit and attack of all other types of operating enemy aircraft.

(c) Defense of friendly fleet spotting machines.
(d) Straffing decks of enemy airplane carriers and fighting tops of enemy capital ships by machine gun fire.

To the young, ardent, and unimaginative flying officers of our service will naturally fall the carrying out of missions of the above nature. Youthful pilots, by virtue of keenness of vision, sensitive reflex action and lack of imagination which, for the peculiar requirements of aerial pursuit and combat work, is a most desirable asset, are unquestionably best equipped mentally and physically to take the fast flying, fast landing, combat planes into the air.

At the termination of the recent war it was generally conceded by students of aerial fighting tactics that individual attack by single seaters was a most unsatisfactory and ineffective method of reducing the enemy's aerial strength. When opportunity permits, therefore, a combat doctrine should be laid down for those forces privileged to operate from aerodromes and airplane carriers to insure the delivery of aerial attacks in formation, and in accordance with prearranged, and frequently rehearsed, plans. As a matter of interest it may be cited that the remarkably successful exploits of the well-known Flying Circus, commanded by the late Baron von Richthofen of the German Flying Corps, were attributable to the rigid adherence to doctrine of all flying personnel under his command. Stations of pilots in the combat formation were made with careful reference to flying experience and marksmanship abilities. To those of least flying experience were assigned stations in the middle of the formation, while flying well above the main group were those especially selected pilots, including Richthofen himself, qualified as expert aerial marksmen. The mission of the main group was to close with any enemy aerial forces encountered, while the special formation held station and reserved fire until one or more of the enemy planes engaged below lost control, or for any reason separated itself from the general *mêlée,* at which time the upper group dove in unison, with full power and subjected the isolated enemy plane to a raking and destructive machine gun fire. The loss to the Allied cause of the services of many of the finest pilots of America, England and France, who fearlessly but unconsciously

matched their prowess against the thoughtfully planned combat doctrine of the Flying Circus, is a lesson which to us should not pass unheeded.

It is believed appropriate at this point to bring to the attention of high ranking naval officers, to whose command aerial combat units may be assigned, the occasional violation on the part of pilots of the rules and restrictions relating to careless flying and stunting at low altitudes. Engine failure, in circumstances of those forms of flying, almost invariably causes fatal crashes resulting in the loss of expensively trained personnel and valuable material, not to mention the deleterious effect occasioned thereby, on the morale of the aviation service as a whole. Severe and prompt discipline should be meted out to those flying officers who, through childish desire to be recognized as pilots of exceptional skill and daring, unduly hazard their lives, the government equipment with which they are entrusted and the integrity and efficiency of the aviation units of which they form a part.

Kite Balloons

Kite balloons, while extensively and effectively used as observation and spotting platforms by land forces during the war, have not as yet demonstrated their adaptability to serve with mobile naval forces. The facilities for their handling, housing and inflating which can be provided ashore do not exist afloat, and cannot be incorporated into the design of ships without seriously disarranging the plans of providing accommodations for other types of aviation instruments of recognized value to the fleet. The advantages and disadvantages of the employment of kite balloons as fleet aviation accessories may be summed up succinctly under the respective headings:

(A) *Advantages*

(a) Balloon moves at ship's speed in excellent relative position for observation of gun fire.

(b) Communication is direct by telephone from observation basket to fire control, via corded cable.

(c) Platforms are steady so long as variable winds are not encountered, and towing ships maintain steady course.

(B) *Disadvantages*

(a) Platform is unsteady immediately following salvos by towing ship, during changes of course and in variable winds.

(b) Changes of courses of towing ships steaming at maximum fleet speed from down wind to up wind, in winds of moderate force, impose serious and endangering strains upon balloon fabric and empennages.

(c) Empennage collapse (which has occurred twice in operations in recent years) releases all air pressure, causes cupping in at the nose and frequently results in looping.

(d) Parachutes are of no value to flying personnel if basket is capsized.

(e) Deterioration of balloon fabric is rapid, particularly in low altitudes.

(f) Operating in high winds and during periods of change in temperature causes excessive loss of gas.

(g) Frequent topping up is necessary requiring availability of a large number of hydrogen cylinders.

(h) In hauling balloons down to the deck in gusty weather, violent yawing and diving frequently occur which may be so severe as to catapult observers from the basket.

(i) Operations of balloons in a fleet engagement require the attendance to the running gear, of men, in exposed position on deck.

(j) Collapse or destruction of balloons may result in the cable fouling the propeller.

(k) Sudden changes of course of towing vessels may cause the balloon cable to foul the mast or radio antennæ (this incident occurred at Guantanamo in March, 1921).

(l) Balloons inflated with hydrogen gas are particularly susceptible to destruction by electrical storms.

(m) The embarrassments attending the failure of kite balloon winches are obvious.

(n) Balloons are particularly vulnerable to attack by combat planes. An aviator delivering a machine gun attack against a kite balloon naturally enjoys immunity from hostile anti-aircraft fire.

An analysis of the virtues and shortcomings of the kite balloon as a fleet aviation instrument leads, it is believed, to the conclusion that, as such, it is of extremely doubtful value.

Rigid Airships

The approaching completion of the rigid airships *ZR-1* and *ZR-3* now under construction for the United States Navy should arouse a general interest in the fields of military employment to which aircraft of those types may be assigned. The history of the operations of the German rigids during the war provides a reference from which the potentialities and limitations of those instruments of aerial warfare may be deduced.

It is well known, perhaps, to most naval officers, that the mission of primary importance assigned the German rigid airships in the past war was the bombing of the industrial centers and the North Foreland areas of England. While the German losses, in the carrying out of this program, were great in comparison with the material damage inflicted, the adverse effect upon the morale of the people and the suspension of war industrial activities imposed by the night raids justified, to the Germans, a continuance of their lighter-than-air policy.

Rigids operating from Cuxhaven and Alhorn were used on occasions in conjunction with the scouting operations of the High Seas Fleet, and their service at such times has been estimated to have been equal in effectiveness to that of three scout cruisers. Such high relative value conceded any lighter-than-air scouting agency, while no doubt appropriate to the conditions of operations during the war, must be discounted at the present time. When consideration is given the development, since the war, of the anti-aircraft defenses of surface vessels and the innovation of the combat plane as a fighting accessory of the fleet, the restrictions and limitations, in naval war operations of aerial craft, depending upon gas for lift, should be thoroughly appreciated.

The substitution of helium for hydrogen as a lifting agency for rigids will reduce, in a large measure, their vulnerability to anti-aircraft fire and combat plane attack, but the bulky dimensions and relatively poor maneuverability inherent in all airships of the rigid type continuously invite aggressive pursuit which, if

continued with determination, can only result in their being driven from station or destroyed.

Prior to the advent of the modern combat plane, airships, when attacked, sought protection in a rapid attainment of altitude at a rate of climb in excess of that possible for any heavier-than-air craft developed during the war. That means of defense is no longer possible in consideration of the rate of climb of the latest pursuit planes which, at the present date, is in excess of two thousand feet per minute.

In the formulation of a doctrine for the attack by single seaters on airships inflated with helium, the use of the incendiary bullet still plays an important part. The rupture by machine gun fire of any of the fuel tanks carried in the hull of the ship might be sufficient to put it out of commission. Until heavy oil is used as a fuel for dirigible engines gasoline fires will always be a serious menace.

It is suggested that the most effective method of attack on rigids is a bombing attack with light case demolition or incendiary bombs, launched immediately a superior attacking altitude is attained. Two such bombs, each of twenty-five pounds weight, could be carried by single seaters without seriously affecting their climbing and maneuvering abilities.

The circumstances of future wars, in which the United States may be involved, can be such as to warrant the use of rigid airships for the bombing of naval establishments on shore, or other land fortifications. Whenever practicable, raids of such nature should be so planned as to permit the raiding ships to arrive over their objectives at night, at high altitudes, where the objects of attack may be illuminated by parachute flares, and the usual inaccuracies of bombing at great heights neutralized by the release of bombs while relatively stationary to the target.

Airships operating over enemy country or in zones where hostile aircraft may be encountered may be fitted to accommodate at least four single-seater pursuit planes, so attached to the hull or body of the ship as to be capable of instant release. If this form of auxiliary defense is adopted the operations of rigids may be extended without sacrifice of morale, provided such planes are fitted with engaging hooks on the top wings, noosed cables may be lowered from the body of the ship and a hooking-on process

accomplished in flight. An appreciation of the practicability of the relatively slow approach of the plane to the drifting noose stamps, it is believed, the scheme as practicable enough to warrant trial.

In times of peace the operations of helium inflated airships from bases such as that provided at Lakehurst, N. J., should be attended with little difficulty and practically no danger to the flying personnel. The construction of permanent mooring masts in various localities in the United States and abroad, and the development of the portable mooring mast, will broaden the field of flying activities for vessels of the rigid type.

In the discussion, which has preceded, of the various types of aircraft adaptable to naval needs, an attempt has been made to emphasize the importance of the maintenance of high morale in our flying service, during both peace and war-time operations. In times of peace the discouragement of reckless flying, provision of suitable equipment, and improvement of radio communications, are contributing factors to an achievement of this end. In war, our flying personnel will carry into the air the bulk of their insurance in the form of ordnance equipment designed for their protection. It is of vital importance that such equipment be carried by our naval planes at all times, to encourage familiarity with its use, efficiency in its operation, and the attending confidence of our aviators in the face of the enemy.

The subject of aviation is of growing military importance. Several of the great powers of the world have adopted aviation organizations which differ radically from our own. The proof of air policy is yet to be determined. May the interest, solicitation and understanding of our men who go down to the sea in ships, everlastingly follow those whose responsibility it may be to uphold and defend the prestige of our country in the air, to the end that they, of our Naval Aviation Service, may be best equipped and insured to undertake the missions of war.

DOES THE NAVY NEED A NAVAL RESERVE FORCE?

By Lieutenant Commander H. R. Bogusch, U. S. Navy

THE United States has no reason to believe that in the unfortunate event of another armed clash it will have command of the sea without fighting hard at the very inception of hostilities. Notwithstanding the provisions contained in the recent limitation of armament conference, the following words uttered by Theodore Roosevelt on December 3, 1901, hold as true today as they did over twenty-one years ago.

> The American people must either build and maintain an adequate Navy or else make up their minds definitely to accept a secondary position in international affairs, not merely in political but in commercial matters. It has been well said that there is no surer way of courting national disaster than to be 'opulent, aggressive, and unarmed.'

It is, therefore, submitted that preparedness still remains a better way to avert war than to trust to international brotherly love and honor. And this statement is made in spite of the recent utterances of such noted men as Professor David Starr Jordan, who says that "the Limitation of Arms Conference leaves no one to talk war but knaves and fools."

In seriously considering preparedness one cannot afford to lose sight of the ever perplexing personnel situation. Ships without trained and sufficient personnel in time of battle will be vanquished. It is not possible to improvise an adequate personnel for our Navy after war breaks out. True, a certain proportion of raw men can be mixed with the highly trained, but this proportion is entirely dependent upon the amount of time the enemy places at our disposal after hostilities commence. An enemy worthy of the name and one who is not handicapped will not waste time before striking.

At the outbreak of the World War it is well known that our Navy was woefully undermanned. Due to lack of a sufficiently trained Reserve Force, it was necessary to detach large numbers

of trained men from first line ships and assign them to duties requiring immediate attention. Armed guards were drawn from our Battle Fleet for auxiliary ships and vessels of the Merchant Marine. Trained men were needed everywhere. The large withdrawal of seasoned regulars from ships' companies wrought havoc. The sacrifice in fighting efficiency that such inroads made in individual ships' organizations was tersely described by one officer of a North Sea Division:

> Prior to the war the crew of the ——— reached such a state of efficiency that the Gunnery Trophy, the Engineering Trophy and the Battle Efficiency Pennant were all three won for the ship. When war was declared, the officers and men felt that they were ready for a fight at a moment's notice. Instead of going forth to fight, however, thirteen hundred men were transferred out of the ship or through it to other vessels which were required to be manned. Petty officers and chief petty officers, nearly all of them went. Enlisted men or younger petty officers were promoted to fill higher positions than they were deemed competent to hold when war broke out. Many officers without any warning were detached from the ship. In their places naval reservists or raw recruits were received on board for training. When the ——— reported to the Squadron Commander for duty in the North Sea it was estimated that ninety-five per cent of the gun pointers had never fired a shot, and a very large percentage of the entire crew had never even heard a gun fired.

This ship did not meet the enemy, but its captain must have appreciated Lawrence's predicament on the *Chesapeake* in his losing fight against the *Shannon*. Training and discipline on the *Shannon* won the day. The scrub crew of the *Chesapeake* lost. In those days the crews for our ships were recruited from seafaring men, men who had followed the sea for years. A few weeks were considered sufficient to shake down a green crew. The simple ordnance of 1812 was mastered quickly. There were no engines, no intricate steam or electrical appliances to comprehend and operate—yet real training was necessary.

A repetition of such conditions as prevailed in the personnel situation at the beginning and during the early stages of the late war may well prove disastrous in the next conflict. The lessons learned must not be forgotten, nor must the engrossing details of peace-time activities smother the effective prosecution of well defined plans for probable eventualities. A Navy without a full complement of highly trained men and an adequate reservoir to

draw upon for men already trained, is a Navy that admits of no expansion. Such is our Navy today. The condition that exists, if not remedied, will cause the very same inroads that were made in ships' companies in 1917.

The total number of regulars allowed from year to year by Congress is never sufficient to man properly the ships and stations required to be manned. Today, owing to lack of men, the Service is robbing Peter to pay Paul. Ships' crews here and there are skeletonized to fill up ships' organizations elsewhere. This system of shiftings and transfers of men cannot be avoided as long as insufficient regulars are provided. However, this state of affairs is not conducive to efficiency or the fostering of individual ships' fighting spirit.

In addition to the necessary intra-fleet transfers, there is a staggering change caused from discharges each year. This loss is made up in numbers by expensive recruiting and reenlistment systems. The present turnover from discharges alone forces the service to assimilate thousands of raw recruits annually. Reenlistments and raw recruits per annum mount into figures approaching 86,000. It is truly remarkable that so high a state of efficiency as is constantly maintained in our Navy is possible. It is a glowing tribute to the untiring efforts of the permanent officer personnel and the continuous service men.

Permanency of enlisted personnel under present enlistment conditions is not possible. Lengthening the enlistment period is one solution. However, officers on recruiting duty are fairly well convinced that lengthening the regular enlistment period will make recruiting far more difficult than it is at present. But such a step would greatly stabilize the existing situation in the regular establishment. Much of the money now spent in recruiting and in training raw recruits could be used for the building up and maintaining an efficient Reserve Force—and such a force is of vital necessity in an emergency.

If transfers seriously affect the efficiency of a peace-time organization, what havoc will such transfers wreak in the fever heat of naval expansion on the imminent approach of hostilities, particularly, when the enemy is seeking battle at the very outset? We will no longer be able to rob Peter. Trained men must be provided to fill up the complements of all fighting units, and

trained men must be provided for the many auxiliaries to be commandeered. From where will these sorely needed men be drawn? If no adequate source of trained men is provided in peace time, the needed numbers will be drawn from hastily organized, swollen receiving centers. Details and drafts will be made from unequipped, raw recruits. Sorting men for jobs in accordance with their ability will not be possible; in consequence, a bank clerk will most probably be made a coal passer, a furnace stoker a yeoman. To obviate such conditions, an adequate Reserve Force is necessary. This means an effective organization, not the decadent one in existence today.

Before entering into the discussion of the Reserve situation as it exists at present, it is well to review quickly past incidents in this organization.

On June 30, 1921, the personnel of the Naval Reserve consisted of 26,376 officers and 203,666 men. This force consisted of six different classes, the preponderance being in Class 4. Approximately fifty per cent of all reservists were in this class and were known as the Naval Coast Defense Reserve. Originally, the members of this particular class were exempt from general service and could only be inducted into general service upon their own volition. This fatal defect was subsequently remedied.

The Naval Reserve Force as a national organization was brought into being by the Act of Congress of August 29, 1916. This was the Navy's first official venture in reserve work. Heretofore, the auxiliary organization was known as the Naval Militia. The organization was under state control. Naturally, the Navy's first venture in reserve work was not one hundred per cent perfect. The many classifications of reservists led to confusion, unnecessary expenditure of money, and last, but not least, volumes of paper work.

On September 29, 1921, the Navy Department in the wake of the economy wave that swept the country was forced to disenroll all members of Classes 2, 3, 4 and 5. The members of these classes were drawing retainer pay and in a haphazard way rendering some training service. This wholesale disenrollment affected 223,951 reservists, or the entire Reserve Force, with the exception of 6,091 in Classes 1 and 6.

This wholesale disenrollment of over 200,000 reservists wrought chaos in the organization. The Bureau of Navigation and the District Commandants were deluged with paper work in the forced process of cashiering the reservist and in writing "Finis" in the form of an honorable discharge to the involuntary, abrupt ending of the reservist's career. The reservist was mustered out—but in mustering him out he was asked to join the Volunteer Naval Reserve (Class 6), an organization bearing a name and little else. Few reservists availed themselves of the opportunity to transfer to this class, with the result that today the Reserve Force is a very defunct organization. With little or no inducement to remain in the Reserve Force, the enlisted men left by the thousands. This exodus took the majority of skilled men—mechanics, engineers and electricians. Recently the organization, in some districts, had an officer for every enlisted man on the rolls.

Among the officers still remaining in the Reserve Force, there are excellent, good, fair, indifferent, and an abundance of dry rot members. This is a sweeping statement, but nevertheless true. The abundance of dry rot is due to lack of specific instructions, indifference, and in some instances due to stress of work on the part of the original enrolling officials. True, the Reserve Force in its inception was a new undertaking. Bars of qualification had to be erected. These were erected, but not until the organization was cluttered with a lot of useless material. In the sweeping disenrollment of the reserves in September, 1921, much of the good material was lost, also some of the chaff.

This condition of the Reserve Force was known to the Department. In October, 1921, a board of six officers appointed by the Secretary of the Navy met in the Department from day to day for a period of thirty days, in an endeavor to submit a complete report embodying the correct principles of organization and administration necessary to the creation and maintenance of an efficient Naval Reserve. The mature deliberations of this board were incorporated to a considerable extent in a Congressional bill for the abolition of the old order and the creation of a new Reserve Force.

The following are some of the principles laid down by the board appointed in 1921 by the Secretary:

(a) That the organization of our naval personnel be harmonious and well-balanced—to consist of the Regular Navy and the Naval Reserve.

(b) That the Naval Reserve Force be an integral part of the United States Navy.

(c) That the Office of Naval Operations be made responsible for the carrying out of approved Naval Reserve policies and co-ordinating the resultant duties imposed by such policies.

(d) That the Bureau of Navigation should remain charged with the duties pertaining to personnel.

(e) That the actual administration of the Naval Reserve Force should be committed to the commandants of the Naval Districts with sufficient officers and enlisted men of the Regular Service to carry on efficiently the administration of the reserve organization.

(f) That the development of the Naval Reserve Force depends primarily on the aid of the personnel and the use of the material of the Regular Navy that can be assigned to that task.

The principles just enunciated are sound. But the Reserve Force will not thrive on logic alone. If the Reserve Force is really considered a vital part of the Navy it behooves those in the regular establishment to become acquainted with this integral part and to develop and train it. During the past two years the Navy has had to struggle hard to maintain itself. It did not have time, or money, or inclination to sponsor the cause of the Reserve Force.

Since the war active training of reservists has been done in a most slipshod and unsatisfactory manner. Some reservists have had their cruise on vessels tied up to the dock during their entire training period. Some have put in their training in lending aid to water carnivals and civic celebrations. Others have done their tour on ships in dry dock or on destroyers in inactive commission. Many have done training on obsolete craft under reserve officers. They have seen nothing of the Regular Navy, and have learned little. A few have had the good fortune to get real training duty on active, modern men-of-war. Their instructors have been regular, seagoing, commissioned officers.

In 1921 a few reservists did training duty on active destroyers. Their instructors had outlined an excellent course of instruction. The reservists did good work and went back into civil life ardent

supporters of the Navy and boosters for a Naval Reserve Force. In contrast with this kind of training, the majority of reservists in 1922 were segregated on *Eagle* Boats or on obsolete men-of-war. They made their cruises under reserve officers. They saw nothing of the Regular Navy. Their instruction was unsatisfactory. In most cases they finished their training duty discouraged and dissatisfied.

Late in 1922, reservists were authorized to take training on modern battleships. Unfortunately, this authorization came so late that the majority of reservists who shunned the earlier, segregated, non-military cruises, could not get away at that time of the year. However, many reservists will take advantage of such an opportunity in the future, if offered them during the vacation period. All that will be required is to give them advance information and afford them the opportunity to train during the months of July, August and September.

The following impressions and experiences of reserve officers will emphasize just what has been said with regard to their method of training:

Lieutenant R—made an *Eagle* Boat cruise in 1922. He went aboard to learn. He found on board nothing but reservists, and the majority of these were officers. He was as well versed in naval science as his instructors. He learned little and finished his cruise with the intention of taking no more until the Navy wants reservists to do real training.

Lieutenant M—made a cruise on the U. S. S. *Litchfield,* a modern destroyer. This ship was manned by regular officers and regular enlisted men. This reservist was one of a number who made this cruise. The ship had an active schedule of employment. The reservists were given proper instructions, and they learned much. They left proud of the Navy and glad they were in the Reserve Force.

Ensign C—made a cruise in 1921 on a ship that never left the dock. The information gained by this reservist will be of little value to the Navy and the nation in time of need.

Gunner's Mate first class G—made a cruise in 1922 on the U. S. S. *New York.* The ship was actively engaged in carrying out its regular schedule of employment. This reservist was anxious to extend his time of training. His captain was anxious to have him. He finished his training period and went back into civilian life a booster for the Regular Navy and for an efficient Reserve Force. His training cost the Navy less than that of the reservist who was segregated and did his cruise on a non-military ship under reserve instructors.

Lieutenant S—, of the Regular Navy, took passage on the *Eagle* Boat,

officered and manned by reservists, during one of the cruises in 1922. These were some of his observations. No discipline. No training. No respect. The ship was overrun by reservists in gold lace. The rank of a reservist was no criterion for the position he could fill. The reservist was anxious to learn, but he had no instructor. The money spent in such training was an absolute loss.

During the hey days of easy money, financial questions presented no difficult problems. Today, however, finances (or more correctly, the lack of finances) are the elements that bar nearly every scheme proposed for the enhancement of the Reserve Force. "Insufficient funds" is the answer to most questions. True, anything worth while costs money, but where the will is sufficiently strong, ways can generally be found to procure the necessary means. In the case of the Reserve Force, the Navy's effort has been too feeble to overcome existing obstacles.

In the first place, there is no practical working policy, and until recently there has been no kind of a policy laid down for the specific guidance of District Commandants. The commandants were groping in the dark. Their task of administration of the Reserve Force without a guiding policy was an undertaking foredoomed to failure. The results accomplished were unsatisfactory. Reservists were dissatisfied, discontented and in some cases disgusted. Every day the Navy was losing more and more of its worth-while members of this auxiliary.

The efficiency of any organization, civil or military, is based upon intelligent execution of every important detail of a well-defined practical policy. Without a policy no execution is possible.

It has been suggested in an issue of the Naval Institute that the records of the individual reservist and the administration of the Reserve Force should be handled by the Service afloat, that such a procedure would be economical and would permit quick mobilization. It will require no lengthy discussion to point out the fallacy of such a contention. The Service afloat is a mobile organization. Units are dispatched here and there. An Atlantic ship will find itself in the Pacific and vice versa. A reservist residing in Chicago or New Orleans, when he receives orders for active duty, most probably, will find his ship thousands of miles from its home port, perhaps in the Mediterranean or even in Asiatic waters. To meet such conditions, an intricate, up-to-date

correspondence system with each reservist is necessary. Even so, much transportation money will be consumed in peace time in handling reservists for annual training purposes. A figure as low as the average transportation of 141 miles per man, which is now met in the various districts, would be impossible. As for quick mobilization, a condition would exist in every naval port of the United States, upon the issuance of mobilization orders, that would beggar description; confusion, congestion and delay would be inevitable. Conditions would be a thousand times worse than are met in an attempt to sort out and return to proper ships in an orderly fashion a large fleet liberty party "half seas over."

The Navy's war and post war experience in Reserve Force matters should be solemnly heeded in all future work pertaining to reserve organization and training. The reservist should be made to feel that the Navy wants him and that the Navy knows exactly what its purpose is in training him. He must get completely over the idea that his training period is nothing more than a red tape requirement or a free touring excursion. The reservist must be handled with tact, but his treatment should not be such as to becloud the stern business for which he is training. Briefly, his training should be a strict businesslike affair, intelligently and painstakingly supervised. If the reservist is not willing to submit to such a method of training, he is not suitable timber for the Navy; and the sooner he is found out and dropped, the sooner will the Navy arrive at a worth-while Reserve Force.

In dealing with the reservist, the Navy can't get entirely clear of politics. This is a disadvantage, but this disadvantage can be turned into an asset if properly treated. If the reservist can be trained and indoctrinated and can be made to feel and appreciate that he is really a component part of the Navy, his indulgence in political issues, local or national, will work to the advantage of the Navy as a whole. If, however, the reservist is not trained and is not shown by concrete examples that he is an integral part of the Navy, he will most assuredly drift away. He will work to bring about some state organization, as, in certain instances, he is now doing. These state organizations will be patterned after the erstwhile militia. The Navy will have little or no administrative voice in them, but on the other hand these state organizations will endeavor to force the Navy to supply equipment and

allocate ships for their use. The Navy will be called upon to do more than it is doing now.

In some districts many reservists have done everything possible to break away from naval control. State organizations have been attempted and in some cases formed. These organizations look upon the Navy more as a source of supply for ships, equipment and retainer pay than they do for naval administration and guidance.

There are two types of enrolled reservists. One is the reservist who is in the organization for all the emoluments without service that he can secure. The other type is the individual who wants to give and learn. This second type is the man the Navy wants and should train. He should receive moderate compensation for his services. The Navy cannot expect to get something for nothing, although it need not give retainer pay as high as has been proposed.

A comprehensive survey of the entire Reserve Force is highly in order if the Navy is to have a real auxiliary to draw upon when the call for expansion comes. After such a survey has been made it will require energetic measures and careful supervision to build up and to maintain a reserve organization that will be worth while.

Much along these lines was accomplished by the board which met in Washington in February, 1923. This board among other things recommended that the Navy's policy with reference to the Reserve Force shall include the following clauses:

> To create, organize and train a Naval Reserve sufficient to provide the supplementary personnel necessary to mobilize the fleet and all its auxiliaries.
>
> To make the Naval Reserve secure in its status and organization as a part of the Navy and to guard its interests.
>
> To cultivate a close association of officers of the active Navy and of the Naval Reserve.
>
> To emphasize in the training of the reserves, the duties most likely to be assigned them afloat upon mobilization.
>
> To be generous in assigning officers to duty with the Naval Reserve, and to educational institutions.

The recommendations just cited were approved by the Secretary of the Navy. Therefore, it is mandatory for the Navy to put these recommendations into effect. The general policy has

been enunciated. It is now necessary to promulgate a far-sighted, working policy for the guidance of district commandants in organizing and administering the Reserve Force.

If the Service as a whole is actively interested in reserve matters and is brought around to realize that the Reserve Force is a component part of the naval personnel, ways and means can be found to administer and train the reservists in spite of any kind of money stringency. But so long as no far-sighted, clear cut, plan of action is put forth, no initiative can be expected from the Service. The Service administers and trains its regulars in an admirable manner, for the reason that it appreciates full well that good men and good ships are the powerful factors that make for assured success. If the Navy can't have both, it will fight with poor ships and good men. But it does have good ships. Perhaps not enough, and if so, then all the more reason why the personnel should be as near perfect as is humanly possible to accomplish.

The Navy's complement of regular personnel has been limited by Congress. The four-year enlistment period causes an enormous turnover of men. Each week the Navy loses from various discharges and other causes from five hundred to seven hundred men. Some of these losses are at present partly recovered by transfers and enrollments in the reserves. During July, August and September of 1922, the Reserve Force gained three thousand members from the Regular Establishment. Many of these new recruits for the Reserve Force are excellent, well-trained men. The bulk of these ex-Navy men are in Classes 1-C and 1-D. Unfortunately, under present restrictions, their services cannot be obtained in reserve work. They are not required to perform any duty. In consequence, their knowledge and ability in naval matters is permitted to grow stale, while the ordinary reservist from civil life goes begging for real Navy knowledge and training.

To make the Reserve Force an organization of vast potential strength it is mandatory that the individual reservist receive proper training on real ships, training under competent instructors—not as it has been done. The kind of training that the reservists received in 1921-22 has in most cases been worse than no training at all! Yet such training has cost the Government approximately five hundred dollars for each individual who did no more than fifteen days active duty per year.

In these piping days of disarmament talk, reduced appropriations and budget paring it behooves the Navy constantly to guard against the expenditure of every unnecessary penny. An inefficient Reserve Force, administered half-heartedly and haphazardly will cost as much as an efficient Reserve Force, probably more. So why not make the Reserve Force an organization worth while, one that will attract the type of men that the Navy and the country need in time of stress?

It can be done, and to such an extent that when the emergency does come, the reservist will be trained, fully equipped and ready to report to his unit, and his unit of fifty or sixty men ready to proceed upon orders to the assigned station. In this way training stations will not be hopelessly swamped and the Service afloat held up days, weeks and months for its men. Once the Service realizes that its war strength is going to come from the Reserve Force sufficient interest will be aroused to insure the maintenance of an efficient Reserve Force.

ATHLETICS

By Lieutenant Commander J. L. Nielson, U. S. Navy

EXTRACT from official Naval Radio press received in Chungking, China, November 9, 1922:

> LOS ANGELES—KID CARROLL NEGRO U S S ARIZONA WON IN SEVEN ROUNDS FROM EXCHAMPION MAYOR U. S. S. TEXAS LIGHT HEAVY WEIGHT NAVY CHAMPIONSHIP BELIEVED FIRST TIME NEGRO NAVY CHAMPION.

This article is not intended to discourage athletics, but to make them more efficient; and to help improve what is now only in fair condition.

I do not think that the money or the time spent on athletics has been utilized so that the greatest good comes thereby to the greatest number.

I think that the athletic allotments have been spent more for entertainment than they have been physically to develop the naval personnel.

We all know, or try to make ourselves believe that an athletic ship is a happy ship.

I grant that the winning of the fleet championship by the U. S. S. ———'s baseball team does create on that ship a happy and contented feeling.

So, likewise, does a Bronxite get the same feeling when he has the satisfaction of reading in the paper that the Giants have copped the pennant. But in a few days that feeling is gone.

What has been gained thereby?

Going back to the Navy; eleven men at the most received some physical exercise. Nine hundred eighty-nine received temporary mental excitement and some good breathing exercise.

That's all.

A week after the pennant has been won what is the status of conditions?

Same as they were before, as nearly as I can analyze the situation.

So we will continue:

An athletic ship is an efficient ship—perhaps.

A championship baseball team helps to make a good fighting ship—perhaps.

Knockout Grogan, vacuum weight champion of the Arctic Fleet on board the Battleship *Polar Bear* has made a name for that ship. Granted. What kind of a name?

And to any other statement regarding athletics the answer is the same "perhaps."

"Why?" you ask.

It all depends.

For what is the Navy striving in athletics? What is the big idea?

Let's get together and analyze the situation. It's worth it. If time is worth anything or money has any value then the time spent on athletics and the money spent on athletics is either worth while under the present system or both are thrown away.

I'm not going to solve any questions but I am going to give you a lot of destructive criticism and let you think about it. It's up to you to decide whether or not Knockout Grogan is of value or is a detriment, and whether or not he is assisting to carry out the principles upon which our athletics should be based: *i. e.*, the physical development of our men, in order that they may properly do their work.

I will probably be criticized for this article if I get over what I am trying to tell you. I hope so. I want to start something. I want to hear what other people have to say on the subject. If I'm wrong, no one has been hurt—except myself. If I'm right, then I've started something in the right direction.

The following is typical:

The time is spring, early March. The U. S. S. ——— is in the harbor of New York. It's on one of those bright warm days of early spring that the weather spells—baseball. Jones and Smith are up on the forecastle playing catch and the spectators are longing to take a hand. The fever is in the air. The same thing is on the mind of every one aboard ship except that of Sing Fat, the captain's Chinese cook. Even Rosario Lopez, the

little Filipino, remembers the day in Manila when he played on the Barrio School ball team. The officers on the quarterdeck are out for a sunning and fresh air. For some unknown reason Lieutenant Smith puts his left hand on his right shoulder and contracts the muscles of his right arm. He remarks unconsciously, "Feels like baseball weather." He is not the only one who thinks and feels the same thing. Every man aboard ship feels the same way and has the same thought. They all want to play. They are boys and need exercise.

Do they get it?

Let's see.

Smith walks over to the Officer of the Deck and requests permission to use his messenger. He gets him.

"Messenger, tell Murphy, the captain of last year's baseball team, that I want to see him."

In a few minutes Murphy shows up.

"You sent for me, sir?"

"Yes, Murphy, how about the baseball team for this year? How many of the old team have you got?"

"There are five of the regular team left but we have some good prospects, sir."

"Well, Murphy, get me a list of the men you think will make good. I want it right away. If you find anyone else who wants to try out we will take him ashore and see if he is any good."

"Very well, sir." And Murphy departs to carry out his orders.

Lieutenant Smith gets his list on Wednesday afternoon. The team with the subs and prospects are out on the field for their initial practice. Lieutenant Smith looks over the prospects with a critical eye. He wants talent, not dubs, and after he has carefully noted how Brown shifts his feet around first base or how Dunn comes in from second base on short hits, he forms his opinion. He notices that Williams, the new man out for center field, is slow and is a poor judge of fly balls, and that Spiker, a new man in right field is absolutely hopeless for the ship's team. He calls Murphy in from the short stop position.

"Brown and Dunn look good to me on first and second. If they hit well enough keep them on the regular squad. Williams and Spiker in the outfield are rotten. You tell them we cannot use them."

Exit Williams and Spiker from athletics and exercise.

Next day Murphy comes up to Lieutenant Smith.

"Dunn, sir, who made such a good showing on second yesterday, is log-room yeoman and the Chief Engineer told him that if he wants to play ball he must have his work done first. Of course that will interfere with the practice of the team. Do you think that you could see the Chief Engineer about this?"

"Yes, Murphy, I'll see him."

That day Smith goes to the Chief Engineer. He realizes that the Chief is on the job and conscientious about his work. Smith must be diplomatic. And so in the best way possible he breaks the news to him about what he wants in relation to Dunn.

"Let me tell you, Smith," the Chief answers, "Dunn is a new yeoman on this ship. He is almost new in log-room work. He doesn't know his job yet, although he is a good man. Now I'll put it up to you. Is Dunn in this ship to be a log-room yeoman or is he here to play baseball? He can't do both. If he is here to play baseball why I guess I can get another yeoman, one who is not an athlete. If he is here to work in my office that is what he is going to do. I don't care what he does in his spare time. I wish he would play baseball. It's good sport and good exercise; but his work comes first. Finally, Smith, the first time that Dunn neglects his work he is out of a job."

Smith was disgruntled and carried his grouch for a week. He then went to the Executive Officer and a new yeoman was assigned to the log-room, while Dunn went to the ship's writer's office. He also played baseball. Smith was happy. The Chief Engineer was partially satisfied. Dunn was feeling all right about the matter; he had very little work to do and he liked to play baseball.

(Exit Dunn from the active ship's complement.)

What's the result? This: the United States hired a baseball player for $60.00 a month. They threw in food and lodging for good measure.

Dunn represents about fifteen men that play good baseball out of every ship's company. That's only baseball. There's football; there's crew; there's boxing; there's wrestling, and other forms of athletics. These men are good athletes and the ship gets a

good name for athletics. Fine work! But the athletic allotment was increased about the sum of the combined salaries of all the participants! And further—has the crew been physically benefited by this? And further—has the fighting efficiency of the ship been benefited?

Now let's sum up conditions as they exist. Let's say fifteen ball players, twenty-two football players, eighteen in two crews, five boxers, and their managers (every navy pug has his manager, but what they do, I've never been able to find out), a few wrestlers. In all say seventy-five men out of a ship's complement that numbers one thousand men are engaged in athletics. Also and not forgetting these men *are engaged in athletics. They are not engaged in ship's work.*

Am I right or am I wrong?

Some readers will say I'm right, others will judge me at fault.

All right, let's talk it over. You readers will admit that when athletic contests are going on (which is practically all the time) every man has body and soul in the fray for winning and thinks of little else. I admire them for it. You will also admit that the reason for a man's being in the Navy is to train himself so that he will become a useful part of the fighting organization of the ship to which he is attached. Our mission is too large and important even to consider any other thought on the subject. You must also admit that if a man's time and thoughts are taken up with baseball he is not thinking much about his job. You will also admit that a professional athlete aboard ship is of very little value as far as the fighting qualities of the ship are concerned. If you don't believe this ask the first turret officer or paymaster or anyone else you wish.

Now I'll start to admit: First, athletics develop a man's body and mind so that he is quick to act and has the strength to act when the occasion demands. I'll admit that athletics has a tendency to divert a man's mind from the routine of ship's life so that it will in many cases prevent his becoming disgruntled and dissatisfied. I'll also admit that athletics creates a ship's spirit which it seems can be created in no other way. This spirit in turn creates a pride which will in many cases continue its influence into the routine of ship's work. If there is anything else

I have forgotten I'll admit that also. I have now reached the point in my estimate of the situation in which I have two almost equal fleets, neither side has any apparent advantages, but I'm in command of the blue so must win. Very well, I will win, I'll call into action my reserve fleet; the nine hundred twenty-five men aboard who are not engaged in athletics. Williams and Spiker are two of them. They, you remember, were kicked off the baseball team *and they wanted to play and wanted the exercise and needed it.*

There can be no doubt that athletics for physical training is an excellent thing. The results obtained when properly handled are marvelous. Fresh air, good food, exercise; these are what a man needs to develop his body. Every reader of this article has sometime made a remark something like this: "Well, if that isn't Perkins, I would hardly have known him. I remember when he came to the ship, a thin, scrawny kid. Now look at him. A six footer and as strong as an ox." Did you ever stop to think and consider where Perkins worked? Was he a striker for electrician or a coal passer or was he pushing a holy stone on the top side in the fresh air? Nine times out of ten he was in the deck force.

Perkins had had the right kind of exercise, but he didn't get it playing baseball; he wasn't good enough for the team.

But what about the striker for electrican, or the pharmacist's mate, or the yeoman, or the storeroom keeper, or any one of a hundred different political jobs aboard ship? What of them? They are the reason for this article.

I maintain that the men who need the physical development do not get it, and those who don't need it in most cases get it. This is not so much the fault of the athletic spirit as found, as it is the fault of the system we are using. If a man is a yeoman he will probably deteriorate because a yeoman's job does not develop him physically. Then we should change our system and develop yeomen and let the deck force, who do not need extra physical development, take care of themselves, or better still, develop them both by the same system.

You will probably say in answer to this that the entire crew, except those on watch, are exercised every morning at setting up

exercises. You're wrong, they are put through the form of exercising and that's all. Next time you see a physical drill or lead one, take a good look at it. What will you see? This: about half the crew going through their exercises like a bunch of jelly fish. I doubt if there are half the crew, contracting and relaxing their muscles any more than is absolutely necessary to go through the motions. If you are doing lunges, for instance, it is necessary to strike out with all your force and at the end of the strike your muscles must be rigidly contracted. Then comes a momentary relaxation and then a forceable contraction again as you come back to the initial position. That gives you exercise. The man who goes through the lunging exercise like a school boy orator reciting "The Boy Stood on the Burning Deck" is not exercising, and please notice that the men who go through the exercises in this manner are the men who need the exercise. You can't blame them, they don't feel like exercising. They are not the full chested, deep breathing, husky lads who live in the open air.

Tell me, is the navy developing men for fighting the ships or are we training pugs (whose names are officially designated Knockout Brown, Kayo Smith, Spider Jones, etc., etc.), in order that they may go out at the end of a cruise with a pocketful of money to advertise the Navy as Buffo Brown, ex-bantam weight champion of the Pacific Fleet?

Do we want that kind of advertising?

Is it important to the efficiency of the Navy that you have half a hundred professional athletes on our ships who do little else than provide entertainments? If it is, I say the entertainment becomes expensive. Is a Commanding Officer going to depend on a man in a crisis who has been trained on a baseball field or one who has been trained at his job aboard ship, with sufficient additional exercise to give him the stamina to stand work?

You can't train him in both places.

How many trips have been made to Receiving Ships to pick out athletes to fill up football or baseball teams when a prospective draft was expected?

Did you ever hear of an officer going to a Receiving Ship to pick out gun pointers? No, you can train them, just as good as you can pick, but, with professional athletes it's different. Of

course this picking out of men is wrong but it's done nevertheless.

I know of a case where a man was held a month at a hospital after he had been recommended to be discharged to duty, because he was a good ball player. And the attending surgeon was raked over the coals for telling the man's Commanding Officer the true state of affairs.

If the men recognize the fact that the officers will do these things in order to keep them aboard ship or on a station, how far will a man's conscience stretch when confronted with his real duty? What do you think about it?

After going through the above I hope you see what I'm trying to get at.

I am not trying to cut out athletics. I am for them, as strong as anyone. But I want to see the men aboard ship who need exercise get it.

I want to see professional ballplayers and prizefighters become professional gunpointers and good ballplayers and good prizefighters.

I want to see a man earn his pay, not in the prize ring or on the football field, but in making his ship more efficient.

I want to see Jones, J.P., F3c, have an hour's strenuous exercise every day in the open air.

I want to see the storeroom keepers, the electricians, the yeomen, the radiomen become red-cheeked men instead of weaklings.

I want to see finally how you are going to do all the above by having seventy-five professional entertainers take the needed exercises for one thousand men and officers.

* * * * * * * * *

Now that you have read it, stop for a moment and think it over. Decide in your own mind whether or not this article is worth while. If it is, start in and see what you can do for the jack-of-the-dust on your ship, and don't forget the radio electricians and the log-room yeoman. If you have decided I'm wrong, why, let me have your worst. But don't come back with anything like this:

He's trying to cut out athletics.

He's trying to cut out intership competitions.

He wants to make us all a bunch of Indian-club-swinging athletes.

He would ruin ship spirit and the pride that comes from good athletics.

Don't criticze along these lines. Good athletics are quite necessary, but not indispensable if they necessitate the forgetting of the real reason for athletics—and that reason is the physical development of the men aboard ship—and Jones, J.P., F3c, is one of these men.

PREVENTIVE DISCIPLINE

By Captain Stanford E. Moses, U. S. Navy

THE efficiency of the Navy and the economy of its operation will be increased directly with improvement in discipline.

The conduct and discipline of the men of the Navy is probably as good today as it has ever been and the character of the average enlisted man perhaps better than ever before. But this is no reason why the Navy should be satisfied with present conditions in matters of discipline if they can be improved. It should be remembered that every improvement which involves new materials or new methods has been forced against the inertia of conservative opinion which believes that whatever is, is best. Naval officers should therefore consider with open and receptive minds suggestions which have for their object the increased efficiency of the Navy and the welfare of the enlisted personnel. Standards of efficiency in Gunnery which seemed visionary and impracticable are now accepted facts, and similar improvement in discipline may reasonably be hoped for if the matter receives such general study, care and attention as has been given to gunnery.

Discipline lies at the root of any organization. It is particularly vital in a military organization. Military discipline has been highly efficient in many instances, but a study of its history and methods leads to a belief that past methods can be improved upon. In shaping and controlling the conduct of men, preventive measures have not been given proportionate weight, as compared with repressive measures or punishment for offenses committed.

By preventive discipline is meant the ounce of prevention rather than the pound of cure in the maintenance of law and order. Preventive discipline is here discussed with particular reference to the United States Navy, but many of the ideas here expressed are fundamental and apply to all men. The purpose of this dis-

cussion is to get a clearer understanding of the causes which underlie infractions of the laws and regulations for the government of the Navy, and then after a study and analysis of the causes, to eradicate some of them before they take root; and to implant higher ideals of discipline and duty where lower standards now prevail. "As the twig is bent, the tree's inclined."

Benjamin Franklin had the Prussian General von Steuben sent to America to train and discipline the raw Colonial troops under Washington's command. Von Steuben wrote back to a friend in Germany: "You have no conception of the difficulties under which I labor. You say to a man, 'Do this,' and it is done. Here, I say to a man, 'Do this,' and must then explain to him the reason why it must be done." This shrewd remark of von Steuben's showed his quick perception of the character of the men with whom he had to deal, and that national trait which required the reasons underlying orders has grown stronger and stronger in the American. It makes discipline more difficult but tends to make the individual more resourceful and self-reliant. This phase of American character, this individual independence which requires the reason behind the rule, makes preventive discipline especially necessary, but it promises great reward for success.

The Articles for the Government of the Navy, our Navy Regulations, and the orders based upon them are fundamentally just and are not unduly severe. The consideration accorded a man on trial before a naval court-martial is usually greater than he would receive in civil life, and, contrary to the generally received impression, the sentences of naval court's-martial are probably less severe than sentences inflicted by civil courts for similar offenses. Good conduct during periods of probation in the great majority of cases still further diminishes actual punishment.

Improvement in discipline, therefore, does not seem to demand any important changes in the laws or Navy Regulations, or in the administration of justice, except that justice should be more prompt. No radical changes are contemplated. It has been well said that changes in administration require for their success a uniform attention to details rather than violent changes of policy. That axiom of commercial business is an excellent statement of the case for preventive discipline; no violent changes but a uni-

form attention to details; more careful consideration of the individual is necessary.

A concerted and systematic effort throughout the entire Navy is needed, especially in the handling of new men serving in the first years of their enlistments, to give a clear understanding of the meaning of the enlistment contract and the oath of allegiance. We must fix in the mind of each recruit a respect for law and order which will not easily be uprooted in new environment or under the stress of the greater freedom and greater temptation experienced when men first go to sea.

While there are exceptions, still it is the general rule that naval training stations fill the average recruit with a healthy interest, zeal and ambition to make the Navy his life's work. He wants to get afloat and see active service in the fleet. He is eager to earn promotion in one line of work or another.

The first undermining of discipline comes within a few weeks or months of the time when drafts of new men go from training stations to the fleet. Greater freedom and more independence of action are given to these new men, scarcely more than boys, without impressing upon them their correspondingly increased responsibilities. They are not taught to think ahead. New men are usually received in drafts. A draft of men is looked upon merely as a group, and is usually treated as a mass of things "each equal to the same thing and equal to each other," whereas they are all different. It has been said that men may be born equal, but they soon outgrow it.

Men must be treated individually and not collectively whenever individual treatment is possible. The officer and petty-officer organization of a military service makes individual handling of men more practicable than in any other organization. To raise the standard of discipline in the Navy there must be more thorough instruction of new men in matters of conduct, penalties and rewards. There must be less stereotyped instruction to drafts of new men or to divisions in ranks; less talking at groups, and more man-to-man instruction. This instruction of new men should begin far earlier than the date of their first reporting on board ship for active service afloat. It should begin at the recruiting station. Instruction as to the meaning of the enlistment con-

tract, the oath of allegiance, the moral obligation to serve honestly and faithfully, and the rewards in the way of promotion and pay for honest, efficient, and faithful service should be made clear to every recruit from the very day he enlists. This primary instruction in the fundamentals of discipline should be thorough and systematic.

There is an actual case of a chief petty officer, serving in his fourth enlistment, who did not know what was meant by the oath of allegiance. Even when an enlistment contract was shown to him and the matter was carefully discussed, it was evident that he had four times signed this binding contract and had taken this solemn oath of allegiance without ever having the slightest conception of what he was signing or what he was swearing to do. This may be a very exceptional case, but there is something lacking in a system where such conditions are possible. This chief petty officer was ordered to recruiting duty, and although his long record of service was excellent, nevertheless, such a man could hardly be expected to impress upon recruits a sense of the moral obligation of a contract, the meaning of which he himself had never appreciated.

The instruction of recruits should not be left to chance or to individual enterprise. It should be carefully formulated and reduced to its simplest terms. This instruction should include the reasons which necessitate enlistment for a term of years, and explanation of the time and cost to the Government of recruiting and training, and the reciprocal obligation of the recruit to render a return to the Government for benefits received.

The plea that time does not suffice for such instruction of individual recruits is not a valid excuse. It is bad business to measure the efficiency of recruiting by the false standard of numbers of men enlisted. The only true measure of success in recruiting is the number of desirable men enlisted. Desirable recruits may become undesirable men. They may be spoiled or go astray in various ways; but every recruit should, at least be started fairly from the moment he enlists.

There are three important points of contact between the recruit and the naval service. First, when he enlists; second, when he first gets into uniform at a training station; third, when he as a new man, first reports on board ship and begins his seagoing

career. On these three occasions each recruit receives an impression of the Navy and forms some idea as to what his future conduct may be and should be. These impressions should be made matters of systematic instruction.

An honorable discharge should be made the goal of every recruit from the day of his enlistment. He should be shown a copy of some honorable discharge which has been issued and a complete copy of the service record which earned that discharge. The Navy system of marks for conduct and proficiency in rating should be explained and the requirements for honorable discharge and for promotion made clear.

Naval training is a matter of education. That it is not exactly a college education makes no difference in the principle that every man who takes this training should be thoroughly instructed at the outset as to its requirements and standards, and its system of records and rewards.

It is frequently asserted that new men understand these matters and that they have been given the necessary instruction. Most men may have been told once or twice, the things that every sailor ought to know, and now and then, though very rarely, a ship is found where every member of the crew is shown each quarter, all entries on his service record; marks are posted, and men understand the merit system. Such ships are very rare, but they point the way to the state of disciplinary instruction which all ships should strive to attain.

Not one man in a hundred who overstays his leave, deliberately or accidently, has any clear knowledge of the advantage to himself of getting back to his ship as quickly as he can. He has a vague impression that the penalty for longer absence is adding up against his record. He rarely understands that the penalties are multiplying instead of adding. He actually believes in many cases that it will make no particular difference to his future career whether he is overleave nine hours or nine days. The general impression that all unauthorized absence up to ten days is very much the same in its after effect is one of the strangest phases of this offense against discipline which has now supplanted drunkenness as the most frequent offense in the naval service.

As to the practical application of measures of preventive discipline, no one man nor any one formula can successfully solve

all problems of the human equation. "A man is a man for a' that" and each man must be handled upon his merits.

Many commanding officers and other officers of experience can point out defective features of recruiting, training, and in matters of discipline; and many of these officers can suggest corrective measures; but there is no existing agency in matters of personnel which can be compared to such an organization as the office of gunnery and engineering competitions, where successes and failures are recorded; where good and bad features are analyzed and defects systematically eliminated and higher standards of efficiency attained.

If a ship fails to reach a set standard in gunnery, the matter is investigated and the causes of failure are analyzed. The personnel situation needs similar standards and analysis of the causes of success or failure.

Preventive discipline cannot be thoroughly discussed in one brief effort. The subject must first be introduced to the thinking element and men of action among the officers and petty officers and men of the Navy.

Volumes have been written in many languages upon this subject of preventive discipline or some of its phases. But the spoken or written word is of no avail until it is heard and heeded.

The trend of naval thought shapes all the progress of the Navy. It is said that a millionaire manufacturer attributed his wealth and his success in life primarily to one thought, one word and one act. He thought of a plan to increase the efficiency of his work and had the word *THINK* placarded in various places before the eyes of his men and their leaders.

The efficiency of the force at once increased and continued to improve.

In the matter of preventive discipline and increased efficiency of naval personnel, the first step is to keep before the eyes of the officers, petty officers and men of the Navy, this one word: *THINK*. After the Navy begins to think about preventive discipline, the solution of the personnel problem will follow.

EARLY INDOCTRINATION OF NEW RECRUITS

By Major J. M. Scammell, Inf., O. R. C.

AMONG the remedies suggested for the prevalence of desertion as described in Captain Leigh's lecture to the War College on Navy Personnel, one, advocated by forty per cent of the officers questioned, was the "Early indoctrination of new recruits." Another twenty per cent suggested "Longer course at training stations."

It may be of interest to the Navy to know that the best-disciplined military organization that the world has ever seen, the Roman Legions, placed a very strong emphasis upon these devices. One author states:

"On entering the service a man was sworn in with every circumstance of solemnity, and he promised, never to desert his standard, absolute obedience to his leaders, and to sacrifice his life for the Emperor and Empire. He was also impressed with the fact that he was raised to the dignified profession of arms, and that his behavior might, on occasion, confer glory or disgrace on the company, legion or army, of which he was a private. The golden Eagle, glittering in front of the legion, was the object of fondest devotion, and it was not only regarded as ignominious, but as impious, to abandon the sacred ensign."

According to Vetegius the recruits, *tryones,* enjoyed none of the privileges of the soldier. The first step was the four months' period of probation during which any recruit found unfit for active duty was rejected. Thereafter came the review by the commander or Emperor. After the review, partly as a mark that the wearer was a full-fledged soldier of Rome, and partly as an indelible identification tag, which served also to detect deserters, the stigma was put on the right arm. It apparently took the place of it, if it did not perform the same function as, vaccination; and left a mark that time could not efface. Then came the military oath.

Polybius describes the ceremony as follows:

"One man being picked out of the legion, with a loud voice after the tribune, rehearsed the formula; where upon the whole legion as one man declared their consent to abide by it; and this, for greater solemnity, they sometime did with their swords drawn and their necks stretched forth."

This solemn ceremony was renewed annually upon the first day of the year; and so powerfully did it affect the imagination of the soldiers that Caesar could rally his shaken troops by recalling to their minds this *sacramentum.* Plutarch tells us that no man was permitted even to take up arms to strike an enemy until he had taken the soldier's oath. When an emergency arose that required the swiftest action, the recruits rallied to the standards for the foot and horse. The oath was not then omitted; but all repeated the oath together. This was called a *conjuration.*

The oath turned the recruit into the soldier. That was with the Romans an estate of privilege and dignity. Under the Christian Emperors heretics were not permitted to serve in the military establishment, and if one were rash enough to enlist he was discharged and heavily fined. Such were debarred also as were effeminate or self-indulgent. It was a profession for real manhood alone. Of course only free men were enrolled, and a soldier could not marry a woman who had ever been a slave.

Other provisions of the law enhanced the dignity of the profession of arms. Physicians and surgeons had to attend the soldier free. Nor could he be jailed for a private debt. Nor, at the period when he was being reviewed, could he be called into court for a civil debt. He was also exempt from torture or any degrading punishment. As with us, a soldier or a sailor could make a verbal will and it was valid. He had only to make known his wishes to his comrades and it had the full effect of a written will.

But none of these privileges was enjoyed by recruits. Instead, they attended the school of the *tyrones,* which was very severe, until such time as they qualified as full-fledged soldiers.

Josephus gives a striking account of the severity of Roman training and discipline, and Ardant du Picq bears eloquent testimony to the efficacy of it. This was made possible by public support and the high regard in which the Roman people held those

who stood between their firesides and the public enemy. But it was also made possible by the intelligent and severe training that the recruits had to undergo before they could attain to the high estate and dignity of a warrior.

Without going into details we may add that the army of the Eastern Empire—that much maligned and misunderstood institution that guarded the frontiers of Christendom for a thousand years, until 1453 A.D.—followed the Roman practice of placing great emphasis upon the recruit period.

The army that was capable of standing off the Persians, Huns, Avars, Bulgars and Turks for ten centuries could not have been as bad as Gibbon has painted it. More recent scholars have done it greater justice. The troops that under Belisarius and Heraclius won such brilliant victories must have belonged to a formidable military instrument.

Maurice, an able soldier who later became Emperor, has left us a copy of his regulations, the *Strategikon.* In that he stresses very strongly the impressive ceremony that was designed to leave its indelible imprint upon the consciousness of the impressionable recruit just entering the Imperial service.

It seems curious that, with all the advantages of scientific psychology at our disposal, we neglect such powerful devices of which the ancients made such striking use. The informality of the oath with us is less a scandal than a stupidity. The medical examination is much more impressive. The whole process of enlistment should be made a dignified and never-to-be-forgotten ceremony. The oath should be elevated to the estate of a sacrament, and it should be repeated annually. Desertion should be treated as a dishonorable breach of faith with one's fellow-citizens. The Articles of War should be read with all the ceremony possible. The Oath, the Articles of War and the Flag should be closely identified in every recruit's mind. The significance of the Naval Service and its glorious traditions ought to be taught at this period. The British Army and our own Marine Corps could tell us how to exploit these assets. So could Kipling. Are we not too tender—too sentimental, with recruits? Is not the genuine kindness to make the boy into a man—a seaman?

> The young recruit is silly—'e thinks o' suicide;
> 'E's lost 'is gutter-devil; 'e 'asn't got 'is pride;

But day by day they kicks 'im, which 'elps 'im on a bit.
Till 'e finds 'isself one mornin' with a full an' proper kit.

But above all we can learn from Rome. Rudyard Kipling knew just what he was about when he wrote in "A Song to Mithras,"—the Hymn of the XXX Legion:

Mithras, also a soldier, *keep us true to our vows!*

That is the spirit that should inspire the seamen of this great Republic; and that is the prayer that they should be taught to utter.

SHIP STABILIZATION

By Lieutenant F. E. Haeberle (CC), U. S. Navy

SHIP stabilization has been a subject of great interest to the naval architect for years and various methods have been devised and experimented with; but all of them have embodied various serious objections which have made them impracticable for use on board naval vessels.

Notwithstanding the difficulties foreseen and encountered the United States Navy has been experimenting with ship stabilizers for the past thirteen years, and this experimentation is still in progress. A short history of this subject, together with a few notes on the troubles encountered, and a brief description of the two types of apparatus lately developed and now being thoroughly tested, should be of interest to the service at large. Recognizing my own imperfect knowledge of the mathematics involved, and assuming that many of the readers will be likewise imperfectly equipped, I shall not attempt to plunge into the mathematical intricacies accompanying a thorough analysis of ship stabilization. An attempt will be made to reduce all the necessary analysis to a simple, practical form and, in the main, to make the article historical and descriptive.

Before entering the main part of the story of ship stabilization in our Navy, it might be well to mention a few of the advantages that have been claimed by those who have been interested in devising a means of keeping a ship on an even keel. Some of the advantages are strictly of a military character, others are commercial; but no attempt will be made to separate or designate them, and I shall limit the discussion to a few words. These claimed advantages are as follows:

(1) Improved gun platform. This claim requires substantiation, or rather it is necessary to prove by a progressive and carefully conducted series of tests that a steady gun platform, such as may be obtained by means of stabilizing apparatus, will

improve the gunnery efficiency of our ships. In light of our present fire-control instruments it might well be claimed that stabilization is not a necessity for efficient fire-control. But the slower motion of the guns over the target may decrease the dispersion and increase the accuracy of fire by the director operator or the gun pointer. At least the serving of the guns should be much easier and more rapid with a steady ship than with a ship rolling fifteen degrees to twenty degrees to a side.

(2) Improved landing platform for aircraft carriers. No extensive comment is necessary on this item, as the advantage is self-evident. While ship stabilization cannot take out the pitching or heaving motions of a vessel, the elimination of rolling removes at least one of the motions of the ship against which the aviator must protect himself in making his landing.

(3) Stabilization would be valuable for transports, hospital ships, and vessels used for animal transportation. On these types of vessels comfort is an advantage of relatively great importance. That stabilizing a ship does improve the living conditions and enhance the comfort of those on board has been amply proved on recent tests of such apparatus on destroyers in a heavy sea. Under circumstances which would ordinarily encourage one hand on a sandwich and the other on a stanchion, the personnel have been able to sit down to the ordinary fare spread neatly and safely on the usual table.

(4) Under certain conditions a stabilized vessel should require less power, and hence less fuel for a voyage during which a sea is encountered. The elimination of rolling eliminates skin friction due to rolling, and hence reduces the resistance offered to propulsion. A stabilized ship should be able to steer a straighter course, thereby shortening the voyage and reducing the fuel consumption. However, these advantages are smaller than would seem on hasty consideration, for the power required for stabilization is in some installations considerable, and power means fuel. No tests have been conducted to date to determine the existence or order of magnitude of this saving.

(5) Under pretty severe conditions a stabilized ship should be a dry ship. Rolling often "wallows" a ship into a wave and considerable water is taken on board; much of this would be eliminated by reducing or eliminating the roll.

Many naval architects and designers, realizing the efficacy of at least some of these advantages stated above, have made a study of stabilization. The effect of the under-water body form on rolling is one of the many problems that every designer must take into consideration at an early part of his design. The steadying effect of comparatively flat surfaces such as deadwoods, keels, bilge-keels, etc., has been recognized for years, and the fitting of bilge-keels has become almost universal practice.

Bilge-keels and similar flat surfaces and appendages are, however, particularly effective only at large angles of roll and their efficiency drops off rapidly as the arc of oscillation is decreased. Consequently, other means for damping these small oscillations have been sought. For a time water chambers extending entirely across the ship were experimented with, and it was found that they were very much more effective in quenching or damping small rolls than were bilge-keels. These water chambers occupied valuable space, required a very exact timing of the transfer of water from side to side, and a proper regulation of the depth of water in the tank in order properly to time its transfer.

The water-chamber system was never extensively used, but a system similar in principle was devised by Dr. Herman Frahm of Hamburg, Germany, which found a somewhat more extensive use, particularly in freighters and passenger vessels. Frahm tanks are U-shaped, located athwartship from side to side, with a bottom water connection, and a top air connection by means of which the water motion in the vertical tanks may be throttled, thus controlling the time of oscillation. These tanks never found extensive applications in war vessels due to several factors: namely, (1) they occupy valuable space; (2) together with their piping, valves, etc., they are too heavy; (3) the water transfer efficiency is low; (4) control of their damping factor is very difficult.

Many efforts have been made in the past to quench the roll of vessels by moving a heavy weight transversely across the ship. The greatest difficulty met in this form of stabilizer is the control of the weight, particularly in a seaway. Failure properly to control the motions of this oscillating weight might result, under some circumstances, in increasing the roll, which could prove dangerous. Many years ago Sir John Thornycroft installed on a

small yacht a hinged weight, the motions of which were controlled by hydraulic cylinders which in turn were controlled by pendulous actuators. The motion of the weight was semi-circular on a fixed radius arm. His control was very ingenious and constituted the first solution of the problems involved in such installations. This application was an interesting experiment and never received wide application due to its small roll-quenching power per ton of total weight, large space requirements, relatively great cost, and cumbersome control. A further improvement in our present time will be described briefly later in this article.

For many years the utilization of gyroscopic phenomena has been given consideration in connection with the stabilization of ships. In simple terms an installation for gyroscopic stablization consists of the following: A heavy wheel is mounted on (for example) a vertical axis, with the ends of the axis mounted in a ring or casing having horizontal, athwartship trunnions which rest in gudgeon bearings rigidly attached to the ship's structure. The wheel is spun at very high speed. When the ship rolls, the axis of the wheel is oriented from its usual spinning position, about a fore and aft axis. Due to the inherent properties of such a rotating mass, the result of such orientation of the axis is that the casing carrying the axis of the wheel tilts fore and aft about the athwartship trunnions of the casing. This tilting is known as precession. When the axis changes its direction due to this precession in the fore and aft plane, there is set up by the heavy spinning wheel (gyroscope) in the athwartship plane a couple which is proportional to,

(1) the weight of the wheel.
(2) the square of the radius of gyration of the wheel.
(3) the angular velocity of rotation of the wheel.
(4) the angular velocity of precession of the wheel's axis.

The roll quenching couple can then be expressed by the following relation:

$$G = \frac{K^2W}{g} \omega_1 \cdot \omega_2$$

where G = the quenching couple.
K = the radius of gyration of the wheel.
g = the acceleration due to gravity.

W = weight of rotating wheel.
ω_1 = angular velocity of rotation of the wheel.
ω_2 = angular velocity of precession of the wheel's axis.

This couple acts about the fore and aft axis and in such a direction as to oppose the rolling of the ship.

The first fairly successful gyroscopic ship stabilizer was developed by Dr. Otto Schlick of Germany, and a few installations of his apparatus have been made on small vessels. Since the gyroscopic phenomena are identical for all types of gyro stabilizers, a statement of the action of any specific type involves essentially a description of the control features. Dr. Schlick's apparatus is called "passive" because the precessional energy is obtaind entirely from the roll energy of the ship, no outside motive power being utilized to force the gyro frame to tilt in the fore and aft plane. The ship starts its roll which causes the pendulous gyro frame to precess fore and aft and this, in turn, sets up an athwartship reaction couple that opposes the roll.

In order that the apparatus may become effective in quenching the roll, it is necessary to brake the precessional motion; otherwise, an uncontrolled gyroscope would convert the entire absorbed energy into precessional mass energy, the ship would become a gyroscopic pendulum, and no quenching would result.

In Schlick's first apparatus the precessional velocity was limited by hydraulic braking proportional to the primary or precessional moment. That is,

$$\frac{d\emptyset}{dt} = (M_p)^n$$

where $$M_p = \frac{K^2\ WR}{307} \cos\emptyset \ \frac{d\Theta}{dt}$$

K = radius of gyration of gyroscope in feet.
W = weight of wheel in pounds.
R = revolutions per minute of wheel.
$\emptyset$ = angle of precession, or tilt.

$\frac{d\Theta}{dt}$ = angular velocity of roll.

$\frac{d\emptyset}{dt}$ = angular velocity of precession, or tilt.

Within certain limits of tilting angles, the arcs $\emptyset$ would be a function of the angle of roll Θ.

Suppose $\Theta = 3°$ and $\frac{d\emptyset}{dt}$ is normal.

Then for $\Theta = 6°$ $\quad \frac{d\emptyset}{dt}$ = twice normal $\quad (n = 2)$

for $\Theta = 12°$ $\quad d\emptyset$ = four times normal $\quad (n = 2)$

Since $\Theta = 3°$ should compel full angles of tilt, the precessions caused by larger unquenched rolls would get ahead of the roll phase and impracticable and increasingly large stabilizing moments and stresses would be set up. It is therefore necessary to increase the exponent "n" to suitable values, since for the central portion of the precession.

$$\frac{d\emptyset}{dt} = \sqrt[n]{\frac{d\Theta}{dt}}$$

In the later installations a disc friction brake operated by an electric magnet replaced the hydraulic brake. The electric magnet was excited by the armature current of a generator geared directly to the precessing frame. "n" was adjustable by field control of this generator. Mechanical limit stops were provided, and the total precession arc was limited to 90° thereby.

The limitations of Schlick's equipment are numerous, and may be itemized as follows:

(a) Since "n" always exceeds 2, the gyro is always somewhat braked and, hence, not sufficiently responsive.

(b) The narrow limitation of the precession angles reduces the roll quenching power per precession stroke.

(c) In case the stabilizer does not hold the vessel near the vertical, "n" must be increased and adjusted for average conditions, since the precessional or primary moment is then so variable.

(d) The control is more complex than necessary, which means constant, expert attention.

(e) The system destroys all energy of roll absorbed, and in case the stabilizer cannot hold the vessel close to the vertical, it is necessary to make special provision for dissipating the heat equivalent to this energy.

(f) No safety devices are provided to hold or control the stabilizer in case the main control should fail suddenly.

(g) The whole system requires too much space and is unnecessarily heavy.

(h) Operation and adjustment require specially trained and reliable attendants.

Such was the history and development of ship stabilization when the United States Navy began to take up the study of artificial means of stabilization about the year 1910. In that year Rear Admiral (then Naval Constructor) David W. Taylor (CC), U. S. N., conducted an exhaustive series of experiments at the Model Basin, Navy Yard, Washington, D. C., and it is due to his interest and analytical ability that the theory of the gyroscope and its application to ship stabilization was reduced to a practical, working basis. The Sperry Gyroscope Company has co-operated willingly and extensively in the practical development of gyroscopic stabilizing apparatus. The only other important collaborator has been Mr. Carl L. Norden, consulting engineer of New York City, who has not only rendered extremely valuable service in the development of the theory, but has also developed a gyroscopic stabilizer for which he claims many inherent advantages over either the Schlick "passive" type or the Sperry "active" type. Mr. Norden has also developed a means by which he claims to be able to control safely and absolutely the motions of an athwartship moving weight, and has embodied his ideas in his "harmonic gravity" stabilizer which is now being tried out and studied in comparison with the latest improved design of the Sperry Gyroscope Company's "active" type gyroscopic stabilizer.

In February, 1911, after the completion of the experiments at the Model Basin under the direction of Naval Constructor Taylor, the Navy Department authorized the extension of these experiments to a larger scale and an experimental apparatus on the destroyer *Worden* was authorized. This was the first gyroscopic stabilizer to be installed on a ship of the United States Navy. It was furnished by the Sperry Gyroscope Company of Brooklyn, N. Y. No detailed description of this apparatus is necessary, as it is decidedly out-of-date in the light of recent developments. Suffice to say that the installation was an entirely experimental one of the "active" type, and, having served its purpose, the equipment was removed.

The next trial installations were made in 1915 and 1916 on the *G-4* and *L-11*, the former being outfitted at the Navy Yard, New York, and the latter at Quincy, Mass. These stabilizers, although of the "passive" type, were also supplied by the Sperry Gyroscope Company. Difficulty was experienced with the method of securing these gyros rigidly to their foundations, and this trouble, combined with other serious defects, proved the type a failure as installed. Such installations are entirely unsuitable for submarines owing to the lack of space available, the extra power required, and the special skill required for operation, adjustment, upkeep and repair. Both installations were removed.

Added interest at this time on the part of the operating personnel gave further impetus to the whole question of ship stabilization. This interest was further evidenced by the General Board who recommended that trial installations be made on each type of naval vessel. Ordnance officers were extremely interested in view of the claim for increased fire-control efficiency. Accordingly, in March, 1915, an installation on a much larger scale than had ever been attempted was authorized, and the vessel selected for this installation was the transport *Henderson.*

The *Henderson* equipment was designed for a vessel with a displacement of 10,000 tons, metacentric height of 2.55 feet and a full period of roll of thirteen seconds, and had a designed roll quenching power of three degrees per single oscillation. The installation consisted of two active gyros, with wheels of nine feet diameter each. These wheels were spun at 1,200 r. p. m. in opposite directions around axes in the horizontal, athwartship plane. Their casings were geared together and were precessed simultaneously in the horizontal plane. A special motor-generator was provided for driving the two 75 H. P. 220-volt, sixty-cycle induction motors. A 100 H. P. direct current 120-volt, precession motor with automatic control was supplied, and operated directly on the ship's power mains. A pair of small gyros controlled the precession of the main gyros.

All the electrical equipment was installed at the Philadelphia Navy Yard by June, 1917, but, owing to the urgent need of the transport for overseas service, no opportunity was afforded for the completion of the installation until January, 1918.

During the war the representatives of the Sperry Gyroscope

Company made several trips with the vessel in order to adjust the equipment and get it ready to stand the prescribed sea tests. Great difficulty was encountered in getting the wheels up to speed due to the repeated wiping of bearings and to lubrication difficulties. A fire-control test was carried out for the benefit of the Bureau of Ordnance and although the installation had not been satisfactorily adjusted and stabilization of the ship was far from perfect, results seemed to indicate that, with the types of fire-control apparatus then in use on naval vessels, stabilization did increase fire-control efficiency, mainly due to the fact that increased firing opportunity was offered by the regularity with which the directorscope "rolled on."

Owing to a fire in an adjoining oil tank the precession motor was damaged by water in the spring of 1920. This damage, together with various other repair items, necessitated by lack of care of the equipment, was made good at Philadelphia in the summer and fall of 1920. In subsequent attempts to get the rotors up to the specified speed, various difficulties were encountered. The bearings again wiped, the lubrication system proved faulty and inadequate and required minor alterations, and the rotors showed strong evidence of unbalance. Every effort was made to place the equipment in condition for thorough sea tests between September and December, 1920, but only partial success was attained.

This installation can frankly be called a failure as far as stabilizing the *Henderson* is concerned. The equipment has never been able to pass the sea tests prescribed by the specifications. Moreover, the displacement of the vessel has been considerably increased by the installation of fixed ballast, the metacentric height is greater than the stabilizer is designed for, and the period of roll is considerably longer than estimated. Since the roll quenching power varies inversely as the product of the displacement, metacentric height and the period of roll, the roll quenching power of this apparatus probably does not exceed one and one-half degrees for the characteristics of the *Henderson* under average service conditions. The apparatus is therefore useless as a stabilizer for this particular ship.

About the time of the *Henderson's* installation, Mr. Carl L. Norden proposed a type of gyroscopic stabilizer which embodied

radical departures in control design. In order to test this equipment, a small apparatus was purchased from the designer in July, 1917, and installed on the Y-gun foundation of Sub-chaser No. 46. This equipment was thoroughly tested and studied after its installation both in port and at sea, and, having passed all the requirements and served its purpose, was removed in June, 1918. Further tests on a larger scale were contemplated when the Sperry Gyroscope Company's latest design was authorized for trial on a destroyer, but patent litigation started by the Sperry Gyroscope Company, and the development by Mr. Norden of his "harmonic gravity" stabilizer, led the government to drop the Norden gyroscopic stabilizer for the time being.

In brief, this stabilizer consists of a gyro which is slightly pendulous and perfectly free to precess between two adjustable limits with any precession velocity not *exceeding* a pre-determined, upper limit. At or above this limit the gyro frame or casing pushes, by means of gearing and an open coupling, against the inertia of its own wheel. The coupling results in a positive metal-to-metal connection between the vessel and the rotor. Consequently any passive or precessional moment exerted by the rotor, after accelerating all precessing parts of the gyro to this maximum precession velocity, is converted into useful rotor or spinning torque. The results of this arrangement, as claimed by the inventor, are:

(1) An extremely sensitive and *automatically centering* gyro, since the only precessional friction it is subjected to is due to the bearings, which may be of anti-friction type.

(2) A reliability and safety of control which is only limited by factors of safety in mechanical elements which are easily calculated. The control is reliable under all conditions. Should the vessel roll a total arc of 100 degrees (fifty degrees to a side) the gyro is controlled just as safely and efficiently as when the total rolling arc is only one degree. No one watching the gyro could detect the slightest difference in its rate of precession or behavior.

(3) All precessional or wave energy not required to cause and maintain precessional motion is *utilized* for spinning purposes. This energy, in other types of control, is destroyed and has been, because of its extreme variability, a fundamental source of trouble, rendering such systems difficult to adjust and operate.

(4) An automatic co-adjustment between sea conditions and rotor speed, since the magnitude of the unquenched roll affects the rotor speed and hence the quenching power of the gyro.

The advantages claimed by the designer for the Norden gyroscopic stabilizer are:

(1) Simplicity.
(2) Lower production cost.
(3) Less time necessary to construct and install.
(4) Rugged and durable.
(5) Little space required for operation.
(6) Gyro is pendulous and self-centering.
(7) Requires little or no outside supervision or adjustment.
(8) Efficient and safe under all conditions.
(9) Safe limit for precessional velocity.
(10) Practically self-running after starting and when stabilizing.
(11) Weight required about two-thirds that of an "active" plant with the same roll quenching power.
(12) Less operating power required.
(13) Rotor attains normal speed quickly due to the fact that the rotor speeds are conservative and any unquenched roll means energy absorbed for spinning purposes.

The only disadvantage inherent in the Norden gyroscopic stabilizer is its inability to impress a roll on the vessel. Rolling the ship with his apparatus is evidently impossible, since no means is provided forcibly to precess the gyro, as all precessional energy is derived from wave energy. It is not believed, however, that this shortcoming is of much consequence in light of the many other advantages.

Up to this time no successful stabilizer had been developed in spite of the time, effort, study and expense devoted to the problem. The Norden stabilizer, it is true, had given excellent promise on test, but the only tried installation of this type was too small to prove conclusively that such an apparatus would perform as efficiently on a large vessel as it did on a small sub-chaser. Undaunted by the intricacies of the problem and bending every

effort possible to overcome the difficulties met in former installations, the Sperry Gyroscope Company continued their studies and, shortly after the end of the World War, submitted another proposition to the Navy Department. The proposed installation was intended for one of the new type of destroyers, as all the problems of stabilization could be studied in detail on such a vessel without entailing the enormous expense that would be necessary to build and install a large equipment.

At about the same time Mr. Norden submitted a discussion of stabilization by means of an oscillating weight and also offered for consideration a gyroscopic stabilizer equipped with Norden constant precession velocity control, although, theoretically at least, Mr. Norden proved several advantages that would obtain with his "harmonic gravity" stabilizer. At first the Department decided to build and install an equipment of each type for the same class of destroyer, but, as previously stated, infringement of patent rights was claimed by the Sperry Company, so the Department decided to drop the Norden gyroscopic stabilizer and to test out and compare the results obtained by the Sperry "active" type of gyro stabilizer with those of the Norden "harmonic gravity" stabilizer. Consequently, the former has been installed on the *Osborne* and the latter on the *Humphreys* and the study and tests of these two kinds of stabilizing equipments are being conducted at the present time.

The "active" type of gyro stabilizer now installed on the *Osborne* contains the latest developments of Sperry's control system. Since it is, so to speak, the "final word" in "active" type gyro stabilizers, a rather complete description of this equipment may be of interest.

The stabilizer equipment consists of five main units: namely,

(1) Main gyro unit.
(2) Precession unit.
(3) Control gyro.
(4) Buffer unit.
(5) Turbo-generator set.

The gyro unit, when properly controlled, exerts a stabilizing couple which counteracts the roll of the ship. It consists of an air-tight casing in three parts, within which is mounted a 6′ 6½″

diameter wheel weighing (including the spinning motor and all rotating parts) 9.75 tons. This wheel spins about a vertical axis at a normal rate of 1,500 r. p. m. The whole gyro unit is supported by the ship's structure on two hollow gudgeons, cast integral with the central portion of the casing and equipped with roller bearings, so that the whole gyro unit precesses about the athwartship axis of the gudgeons.

The precession unit controls the rate and time of precession of the main gyro unit. It consists of a 14 H. P. precession motor, reduction gearing, a precession gear cast on the casing, two precession brakes, the centralizer and limit switches and the control switches and relays on the switch-board. The precession motor is geared to the gyro casing through a 110 to one reduction gear train, and is started, stopped and controlled by the control gyro and relay switches on the panel. The precession brakes are clamshell brakes, spring set, and released by the operation of shunt wound magnets. They are operated electrically from the precession motor control switches, releasing when the precession motor receives current, and setting when precession stops.

The control gyro consists of a small wheel rotating on a horizontal athwartship axis mounted in a casing whose trunnions are carried on a vertical axis. When the vessel rolls, the gyroscopic action of the high speed wheel causes the casing to precess about the vertical axis, electrical contact is made and the precession motor starts forcibly precessing the main gyro unit. Limit switches are fitted which cut off the precession motor current in case the precession angle exceeds a certain angle from the vertical (set at about fifty-five degrees). There is also fitted a centralizing feature which is designed to keep the gyro unit precessing approximately equal angles on each side of the vertical, thus taking advantage of the most efficient part of the precession arc.

The buffer unit and safety lock is a positive stop for the precession of the main gyro unit. If the mechanical brakes should slip, or become inoperative for any reason, or if the gyro should precess beyond sixty degrees from the vertical due to failure of some part of the control to function properly, the buffer is designed to absorb the shock of the impact at the end of the precession arc, and to lock the gyro unit to prevent further precession until the cause of the trouble is located and remedied.

The power for spinning and precession is supplied by a special turbo-generator. This turbo-generator has two ends: (1) a 51 KW, 51-cycle, 160-volt, three phase A. C. generator which supplies alternating current to the 38 H. P. squirrel cage, induction, spinning motor mounted on the lower stub of the wheel's axle; (2) a 12 KW, 125-volt D. C. generator which supplies the armature current to the precession motor. All exciting currents, including the fields of the A. C. and D. C. generators, the coils of all the contactors and relays, and the control gyro's spinning motor are taken from the ship's supply.

Other less important items will be listed only. In some cases the items given are assemblies, but it is not neecssary or profitable to divide them.

(1) Hydrostatic jack pump.

Lifts gyro rotating element and takes weight off the Kingsbury thrust bearing until wheel has speeded up to about 150 r. p. m.

(2) Vacuum pump and control.

Maintains automatically an approximate fifteen-inch vacuum inside gyro casing, thus reducing the spinning power required.

(3) Reduction unit oil pump motor.

The reduction unit has an independent lubrication system. When the stabilizer equipment is operating, the oil is pumped by a standard gear pump driven from the high speed shaft of the gear case, but when first starting to precess it is necessary to get oil to the bearings and this is done with the ⅛ H. P. reduction unit oil pump motor.

(4) Lubrication system.

Steam pump for starting, tank, cooler, duplex strainer, valves, piping, etc.

(5) Miscellaneous.

This item is intended to cover banks of grid resistors, voltmeters, ammeters, switches, relays, rheostats, panels, switchboards and other small fittings which, though necessary, are not of sufficient importance to be described in any detail.

The equipment described above was installed on the main deck and protected from the weather by a lightly constructed deck house. The dimensions of this house were roughly as follows: length, 30 feet; width, 10.5 feet; height, 11 feet. The weight of the rotating element, as stated previously, is 9.75 tons. The weight of the entire equipment, excluding the weight of the foundations and deckhouse is 23.8 tons. It will be seen that less than forty-one per cent of the total weight involved in this type of gyroscopic stabilizer is really useful weight, since the quenching power obtainable is dependent on the weight of the spinning mass alone. Also, it will be noted that the total weight of the equipment, exclusive of the necessary foundations, is about two per cent of the displacement of the vessel on which it is installed.

Although all operating and endurance tests have been completed, this stabilizer is being retained on the *Osborne,* in order that certain firing tests of the vessel's battery may be conducted, for the purpose of determining what effect, if any, stabilization may have on the accuracy of fire of the ship's guns. As the installation has been made on the main deck in a location which makes the operation of one of the deck torpedo tubes impossible, it is, of course, inadmissable as a permanent location. Of course, if the gyroscopic stabilization of destroyers is taken seriously, the location of the apparatus must be considered in the early stages of the design, in order that provision may be made for the weight, space and power requirements. To install such an apparatus on our present destroyers as a permanent part of the vessel's equipment, would probably mean the loss of one boiler and a consequent loss in the reliability and life of the boiler plant and a reduction in the speed of the ship, either of which would be serious.

It is not out of the way at this point to call attention to two criticisms advanced concerning the application of gyroscopic phenomena for roll quenching purposes, wherein it is claimed that the apparatus is liable to cause the appearance of pitching motions and of dangerous rolling.

When the apparatus is functioning, the couple exerted by the brakes in the longitudinal plane of the ship reacts on the hull and tends to produce pitching. In other words, a part only of the energy of rolling is transformed into heat in the brake, and the

other part is dissipated by producing pitching. This reasoning is exact and one experimenter has been able to reproduce this pitching motion by the use of a model; it could also be demonstrated on a ship which is not very long compared with its beam. But it must not be forgotten that the couple necessary to give a ship pitching inclinations is about 100 times larger than that necessary to roll the ship a corresponding amount. Furthermore, the braking couple is much smaller than the righting couple. Therefore, if the apparatus is successful in maintaining the vessel sensibly upright on a wave which takes inclinations of eight degrees, for example, the amplitude of the pitching, which the couple due to braking will produce, will be measured by an angle about 1,000 times smaller. The influence of the gyroscopic installation on the pitching can therefore be considered negligible.

Along the same line, another objection has been advanced, which at first sight seems much more serious. If the vessel pitches, the spinning wheel, compelled by the brake to take part in this pitching motion, will exert on the ship a transverse couple and cause the ship to roll. This fact has also been verified by an experimenter by means of a model. It can be shown, however, that in the case of a real ship this is little to be feared. Suppose, to take an unfavorable case, that the gyroscope is locked by its brake, and suffers all the inclinations of pitching. Suppose further, that the ship pitches without rolling. We know from experience that the motions of pitching are always of small amplitude; therefore, the gyroscopic reaction couple which results will be weak, and this will also be true concerning the rolling which this couple impresses. This couple, which is alternating in its action can cause rolling, but in order for this to become dangerous it would be necessary for the pitch and the roll of the ship to have identical periods, which does not take place. It was because of these actions that the two wheels of the *Henderson* were spun in opposite directions and had their casings geared together. During the rolling, they assume at each instant inclinations in the opposite direction and exert, through their brakes, pitching moments which annul each other. Likewise, during the pitching, the same action takes place, and the tendency to roll the ship due to pitching motions is eliminated.

The other type of stabilizing equipment which is being tested

and compared with the gyroscopic apparatus, to which reference was previously made, is the Norden "harmonic gravity" stabilizer. The basic principles of this apparatus are quite similar to those followed years ago by Sir John Thornycroft in his early experiments with stabilization.

Since the time of Sir John Thornycroft, improvements in practical elements of construction, and our greater theoretical knowledge of the subject, have made it practicable to develop a gravity stabilizer with much more quenching power per ton of weight, requiring much less space, and with more efficient, reliable and safe actuating control.

The following brief description of this apparatus will suffice to demonstrate the general principles involved.

A weighted car rolls on four wheels across the ship on two athwartship tracks. Carried on the car is an inertia element, consisting of a solid cast steel rotor, three feet in diameter. This rotor is coupled to the ship through gears, a pinion, and a rack fixed to the deck, and is also geared to a small spinning motor which starts the spinning and assists in its regulation. The general function of the control is to make this weighted car travel back and forth across the ship in simple harmonic periods a quarter of a phase behind the natural roll of the ship. The effect is just the opposite to that obtained when sallying men across the deck to produce a roll, in which case the men always run "up hill." In the Norden "harmonic gravity" stabilizer, the weight always runs "down hill," and thus checks the roll. The apparatus can be used to impress a limited roll on the ship in case this is desired.

Although the mathematical analysis of the motions of such a control are not very difficult, it is beyond the scope of this article to include them. But, so far as the quenching effect is concerned, it is desirable to place the oscillating weight as high as possible above the axis of oscillation of the ship, and the greater the athwartship travel of the weight, the greater is the quenching power developed.

The advantages claimed for this type of stabilizer are as follows:

(1) Requires less space to install.

(2) Requires decidedly less stabilizing weight, since the arm through which the weight acts can be made so much greater than is possible with gyro installations where the arm of the stabilizing couple is fixed.

(3) Requires decidedly less outside power to operate.

(4) Time necessary to build and install a great deal less.

(5) Construction can be carried out at a navy yard.

(6) Can be designed with greater factors of safety than is possible with gyro equipment.

(7) Control is more positive, and is absolute and safe.

(8) About ninety to ninety-five per cent of the total weight can be made useful.

(9) Requires very little attention and supervision, and no adjustment to meet variable sea conditions.

(10) Can be manufactured and installed at much less expense.

(11) Equipment does not store an excessive amount of energy which might become dangerous to the safety of the vessel if not properly controlled, or released in any manner whatsoever.

This apparatus is now installed on the *Humphreys.* It has not been thoroughly tested, so no definite conclusion can be reached at the present time. A preliminary trial has been made and, to say the least, the equipment looks promising. At the present time the inventor is perfecting a few minor items of his control which should improve the stabilizing effect obtained, and the final tests will probably be conducted some time during the coming summer.

Such is the story of ship stabilization. As far as the writer knows, no definite conclusions concerning this interesting subject have yet been reached. Much remains to be proved and a great deal of study and experimentation is still required. But as long as the advantages of stabilization are not *disproved,* the subject will retain its importance and, no doubt, the Navy will continue its efforts toward an efficient and satisfactory solution.

MODEL TANK EXPERIMENTS BY BENJAMIN FRANKLIN

By Captain Elliot Snow (CC), U. S. Navy

IT IS not generally known to naval architects and marine engineers that Benjamin Franklin, at one time, interested himself in the subject of the resistance of ships and that he actually made some experiments with a model to determine the difference in resistance of barges between shoal and deep water navigation.

His interest in this subject and the experiments which followed arose from a chance inquiry that he made of a boatman while traveling on one of the barges in a Holland canal. The results of these experiments are recorded in a letter written by Dr. Franklin, dated Craven St., London, May 10, 1768. This letter is of so great historic interest, that it is here quoted in full:

"TO DR. JOHN PRINGLE, LONDON.

On the Difference of Navigation in shoal and deep water.

Craven Street, May 10, 1768.

Sir:

You may remember, that when we were traveling together in Holland, you remarked, that the trackschuyt in one of the stages was slower than usual, and enquired of the boatman what might be the reason; who answered that it had been a dry season, and the water in the canal was low. On being again asked if it was so low as that the boat touched the muddy bottom; he said, "No, not so low as that, but so low as to make it harder for the horse to draw the boat." We neither of us at first could conceive that if there was water enough for the boat to swim clear of the bottom, its being deeper would make any difference; but as the man affirmed it seriously, as a thing well known among them; and as the punctuality required in their stages was likely to make such difference, if any there were, more readily observed by them than by other watermen who did not pass so regularly and constantly backwards and forwards in the same track, I began to apprehend there might be something in it, and attempted to account for it from this consideration, that the boat in proceeding along the canal, must in every boat's length of her course, move out of her way a body of water, equal in bulk to the room her

bottom took up in the water; that the water so moved must pass on each side of her and under her bottom to get behind her; that if the passage under her bottom was straitened by the shallows, more of that water must pass by her sides, and with a swifter motion, which would retard her, as moving the contrary way; or that the water becoming lower behind the boat than before, she was pressed back by the weight of its difference in height, and her motion retarded by having that weight constantly to overcome. But as it is often lost time to attempt accounting for uncertain facts, I determined to make an experiment of this when I should have convenient time and opportunity.

After our return to England, as often as I happened to be on the Thames, I enquired of our watermen whether they were sensible of any difference in rowing over shallow or deep water. I found them all agreeing in the fact, that there was a very great difference, but they differed widely in expressing the quantity of the difference; some supposing it was equal to a mile in six, others to a mile in three, &c. As I did not recollect to have met with any mention of this matter in our philosophical books, and conceiving that if the difference should really be great, it might be an object of consideration in the many projects now on foot for digging new navigable canals in this island. I lately put my design of making the experiment in execution, in the following manner:

I provided a trough of plained boards fourteen feet long, six inches wide and six inches deep, in the clear, filled with water within half an inch of the edge, to represent a canal. I had a loose board of nearly the same length and breadth, that, being put into the water, might be sunk to any depth, and fixed by little wedges where I would chuse to have it stay, in order to make different depths of water, leaving the surface at the same height with regard to the sides of the trough. I had a little boat in form of a lighter or boat of burthen, six inches long, two inches and a quarter wide, and one inch and a quarter deep. When swimming, it drew one inch water. To give motion to the boat, I fixed one end of a long silk thread to its bow, just even with the water's edge, the other end passed over a well-made brass pully, of about an inch diameter, turning freely on a small axis; and a shilling was the weight. Then placing the boat at one end of the trough, the weight would draw it through the water to the other.

Not having a watch that shows seconds, in order to measure the time taken up by the boat in passing from end to end, I counted as fast as I could count to ten repeatedly, keeping an account of the number of tens on my fingers. And as much as possible to correct any little inequalities in my counting, I repeated the experiment a number of times at each depth of water, that I might take the medium. And the following are the results.

Water 1½ inches deep.		2 inches.	4½ inches.
1st exp.	100	94	79
2	104	93	78
3	104	91	77
4	100	97	79
5	100	88	79
6	99	86	80
7	100	90	79
8	100	88	81
	813	717	632
	Medium 101	Medium 89	Medium 79

I made many other experiments, but the above are those in which I was most exact; and they serve sufficiently to show that the difference is considerable. Between the deepest and shallowest it appears to be somewhat more than one fifth. So that supposing large canals and boats and depths of water to bear the same proportions, and that four men or horses would draw a boat in deep water four leagues in four hours, it would require five to draw the same boat in the same time as far in shallow water; or four would require five hours.

Whether this difference is of consequence enough to justify a greater expense in deepening canals, is a matter of calculation, which our ingenious engineers in that way will readily determine.

I am, &c.,

B. Franklin."

The principal factors which differentiate shallow water resistance from deep water resistance are now fairly well known. These shallow water effects are pointed out in most of the treatises on the resistance of ships, and screw propulsion. A very simple explanation of this kind is to be found in the *Speed and Power of Ships,* by Rear Admiral D. W. Taylor (CC), U. S. N., Retired, from which the following extracts were taken:

When the water can move freely past the ship in three dimensions, the pressures set up by the ship's motion would naturally be less than when shallowness compels the water to motions approaching the two dimensional characters.

In shallow water these extra pressures cause waves larger than those in deep water, and in shallow water the lengths of waves accompanying a ship at a given speed are greater than for the same speed in deep water. These are the principal factors differentiating shallow water resistance from deep water resistance. There is a third factor; namely, the change in stream velocities past the surface of the ship when in shallow water.

This factor would increase resistance somewhat, but its effect would seem to be so small that it is not necessary to consider it since we cannot at present determine with much accuracy the effect of the dominating factor; namely, the change in wave production.

It is also interesting to note, in connection with Benjamin Franklin's historical experiment, that the question of increased resistance in canal navigation had to be taken into account when designing the electric locomotive tractors used at the Panama Canal.

THE BRITISH LIFEBOAT SERVICE

By Commander S. C. Douglas, R. N.

I.

TO THE uninitiated, a magazine devoted to the interests of warfare might not at first appear to be the most suitable medium for a discourse on the Lifeboats of a Foreign Society.

Happily, however, with the notable and ignoble exception afforded by Germany in the war, the succor of his brother in distress, even at the risk of his own life, has been from time immemorial an instinct of the seaman, which neither language nor nationality can obliterate. Indeed, as far as America and Great Britain are concerned, it is pleasing to recall that in the history of the two countries, there has been no single instance of unchivalrous behavior on the part of their seamen either in peace or war. On the contrary, the chivalry and humanity displayed toward one another when they were foes, was carried to lengths which anyone unacquainted with the ties of language and blood which bind the two countries together, might deem quixotic. That, however, is by the way, and is only mentioned in the hope that it offers a sufficient excuse for a brief account of a life-saving instrument in a magazine whose readers are perhaps more intimately associated with instruments of a less philanthropic and more bloodthirsty nature!

Space forbids an account of the evolution of the Lifeboat Service, absorbingly interesting though the subject is. It is of interest to note, however, that the Royal National Lifeboat Institution is now in the hundredth year of its existence, and that it does not receive a single dollar from the State, but has always been supported by the voluntary contributions of the British people. At the same time, it is only fair to add that it receives gifts in kind from the Government in the shape of electrical communications and warning of casualties. For this reason the fullest measure

of co-operation with the Coastguards is essential and the Lifeboat Authorities at each station are largely dependent upon this force for information of casualties and advice as to calling out the boat. Incidentally the Coastguard has no power to order out a boat, although his is the responsibility for warning the Coxswain. The reason for this is simply that the Lifeboat Service is not a "State" Service in the accepted sense of the word, and the Coastguard, frequently not a local man, may not be so well qualified as the Coxswain to take an important decision as to the launching of the boat. It is hardly necessary to add that the relations between the two Services are of the most amicable nature, and in many instances lifeboat crews include Coastguards, whose knowledge of signalling is, of course, an invaluable asset to the boat.

Before describing the different types of boats, a very brief account of the organization of the Institution may be of interest.

Its affairs are administered by a Committee of Management, having under their direction the Secretary of the Institution, Mr. George F. Shee, who is generally responsible for the administration, the raising of funds, payments and all matters not of a technical nature. The technical side of the work is handled by a Chief Inspector, who is always a naval officer. The present holder of this office is Captain H. F. J. Rowley, C. B. E. R. N., who will be known to many American naval officers who were with him at Inverness where he was senior naval officer during the war and for which the U. S. Government awarded him the Distinguished Service medal. He has under him a Deputy Chief Inspector and five District Inspectors, all naval or naval Reserve officers, and in addition there is a Surveyor of Machinery, a Surveyor of Lifeboats and a staff of assistants for duty in the Head Office and on the coast. A storeyard in London, containing a workshop and storerooms, and having access to the River Thames, is controlled by a retired Captain R. N. Here small repairs are carried out, and supplies of every conceivable item of equipment or machinery are stocked in readiness for immediate supply to the coast. There are also a number of reserve pulling and sailing boats ready for instant dispatch in case of injury to a boat on the coast. Special facilities are granted by the railway companies for the carriage of lifeboat stores.

The district inspectors are directly responsible for the exercising of boats, the drilling of the crews, and the general efficiency of the station. Woe betide the district inspector if a rope carries away on service or is found to be rotten!

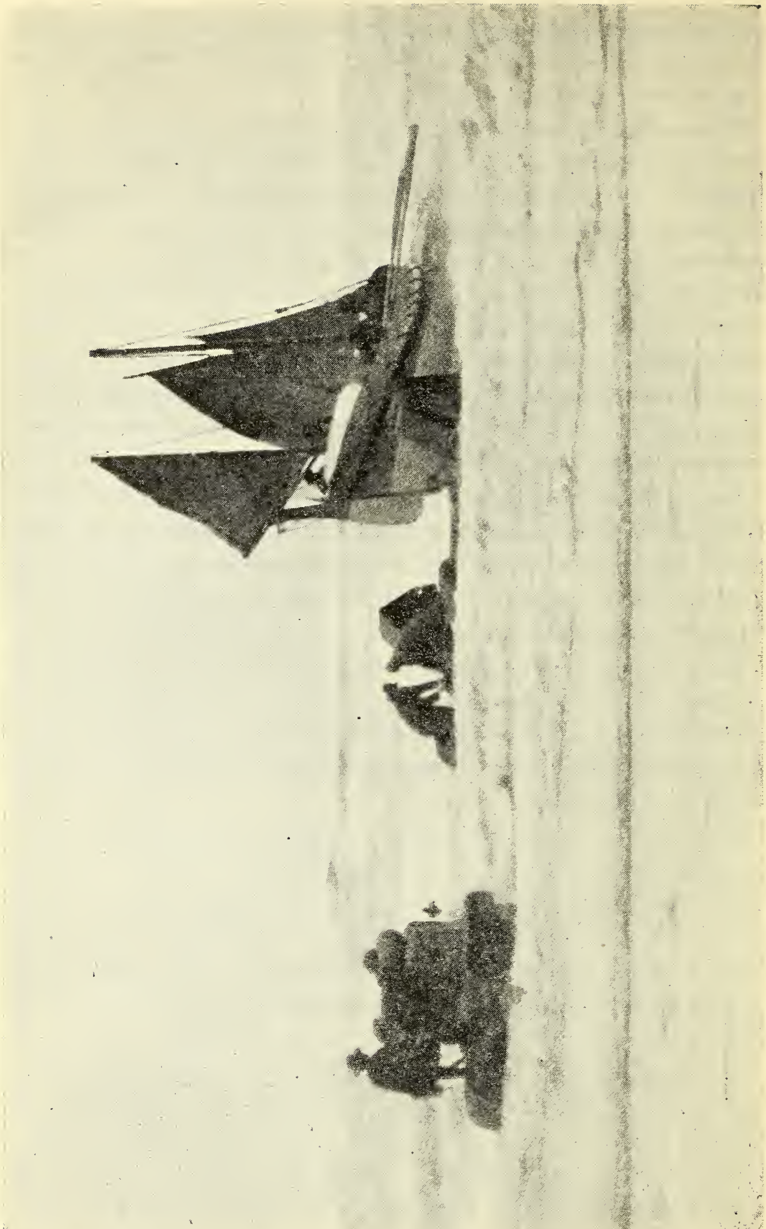
These officers must have not only technical qualifications of a very high order, but they must be fitted by patience, tact and temper to win the confidence of the fishermen and seafaring population on whom the Institution relies for its crews. It is an unwritten law that if an inspector is in the neighborhood when a lifeboat is called out to a casualty, he accompanies the boat, and as recently as October, 1922, Commander E. S. Carver, R. N. R., accompanied the Lowestoft Motor Lifeboat out on service and received the Silver Medal of the Institution for his gallantry on that occasion. The service is perhaps sufficiently noteworthy to warrant a digression and brief description of it.

At 9:45 P. M. on October 19, 1922, the Coastguard at Gorleston, Norfolk, observed rockets to the N. E. These rockets came from S. S. *Hopelyn* a vessel of 2,348 tons bound from Newcastle to London with a cargo of coals. She was ashore on the N. E. Scroby Sands, a notorious death trap off the coast of Norfolk.

Three minutes later Gaister, a mile or two north of Gorleston, reported they were getting ready to launch. At 10:40 P. M. the Harbor Master at Gorleston rang up Gaister to ask whether their boat had been launched. Gaister reported unable to get afloat owing to heavy seas.

At 11:00 P. M. Gorleston No. 1 Lifeboat launched and proceeded in tow of a tug to the scene of the wreck. The wreck was reached at 12:50 A. M. on the twentieth, but nothing could be done owing to the darkness and terrific seas. At daylight the lifeboat was able to get nearer to the ship but no signs of life were visible on the midship portion, which was all that was left. Heavy seas were breaking over this portion.

For two hours the lifeboat remained in the vicinity and being then forced to the conclusion that there were no survivors she returned to harbor, arriving at about 9:00 A. M. on the twentieth. About one hour later Caister Coastguards reported that a signal of some description was being shown on the wreck and the lifeboat immediately put to sea again.



In the meantime, Commander Carver, Eastern District Inspector, arrived at Gorleston in the ordinary course of his duties and learned of the occurrence. Commander Carver remained in the Coastguard lookout, being in continuous communication with Caister who could at times see both the wreck and lifeboat.

At 3:30 P. M. Commander Carver seeing that the Gorleston Lifeboat was unable to do anything, decided to call out the Lowestoft Motor Lifeboat. The message ordering this was despatched at 3:45 P. M. and the Motor Boat was launched and proceeded to Gorleston to embark Commander Carver in accordance with his instructions.

There was then a strong northeasterly gale blowing with a heavy sea and darkness set in before the wreck was reached. On the way out to the wreck the tug and Gorleston No. 1. boat were met on their way back to harbor. The coxswain of the Gorleston boat explained that he had been unable to get alongside owing to the terrific seas, broken portions of the hull and the remains of an old wreck some thirty or forty yards off the bank. His boat had been damaged by striking heavily on the sands, the mizen outrigger being broken and gunwale stove in. Commander Carver asked the coxswain if he was willing to return to the wreck and this he immediately consented to do and embarked in the Lowestoft boat. On arriving at the scene it was obvious that nothing could be done for the time being, and the only chance of a rescue appeared to be that offered by towing out Gorleston No. 2 lifeboat, a very much lighter boat, so as to get nearer to the wreck.

Accordingly the Lowestoft Lifeboat returned to Gorleston arriving at 7:30 P. M. and everything was made ready for towing No. 2 boat out at daybreak. At 3:30 A. M. on the twenty-first, Commander Carver mustered the crews of both boats and after consultation arrived at the conclusion that it would be running a grave risk to take out No. 2 boat in the heavy sea then prevailing, and these gallant men left Gorleston once more in the Lowestoft Motor Lifeboat at 4:30 A. M. on the twenty-first. The gale had by this time slightly diminished in force although there was still a very rough sea which was particularly heavy on the sands.

The wreck was reached at daybreak and all that remained visible was the bridge, funnel and fidley casing; in fact, there

was barely the length of the lifeboat left. The coxswain dropped anchor to windward and veered down to the vessel. Whilst doing so a terrific sea struck the boat and almost threw her on to the afterdeck, the situation being saved only by the motor, without which the District Inspector states they must have been lost. The lifeboat then sheered alongside and the shipwrecked crew, to use the words of the District Inspector "slithered down ropes into the lifeboat in about thirty seconds." The lifeboat then sheered off and steamed up to her cable but it had fouled a portion of the wreckage and had to be cut. Whilst doing so a huge sea struck the boat broadside on and it was fortunate that no one was washed out. Course was then set for Gorleston where the boat arrived at 7 A. M., rescuer and rescued receiving a great ovation from the townspeople as they proceeded up the narrow river. The total number saved amounted to twenty-four and a black kitten.

For this very meritorious service the two coxswains received the Gold Medal of the Institution and the crews either the Silver or Bronze Medal in addition to generous monetary awards.

Before proceeding further, a few words must be said with regard to the manning of the boats. The uninitiated are apt to jump to the conclusion that because this is a voluntary service, the crews of the lifeboats are volunteers. This, however, is only partially true, as a service, whether successful or not, carries with it a handsome remuneration to the crew. The men are also paid a modest sum for the monthly or quarterly exercises (Motor Boats are exercised every month so as to test the machinery; pulling and sailing boats only go out once a quarter.) With the exception of one or two isolated stations, however, they are not "whole time" men and the fact of a man being a member of the lifeboat's crew puts him under no obligation to go out if he does not wish to do so. He is in this sense, a volunteer. I need hardly say, however, that a man who was willing to go out in fine weather but not in a gale of wind, would receive scant sympathy from his fellows and would not retain his place in the boat for long. It is also a case of "noblesse oblige" with the coxswain, second coxswain and bowman, who receive an annual retaining fee in addition to their exercise and service pay. Indeed, the coxswain receives a fairly good wage, as in addition to his retaining fee of

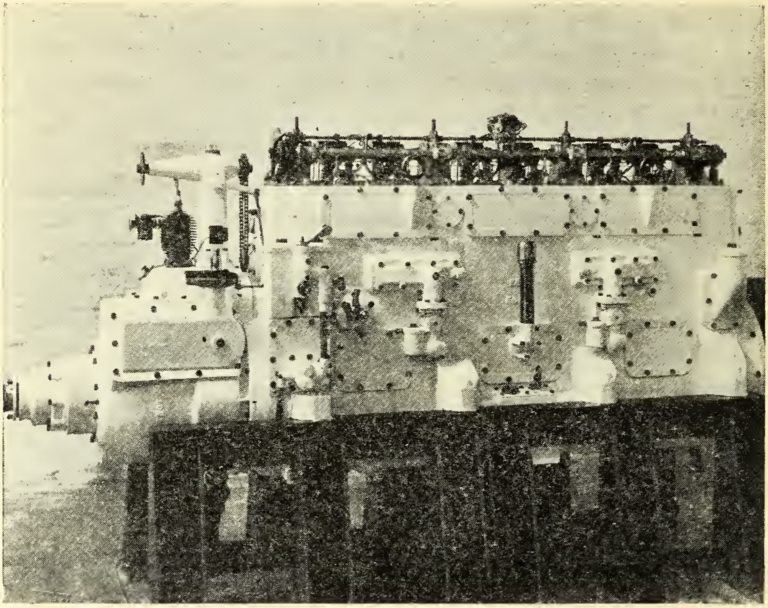
possibly £20 per annum, and his exercise and service money, there are also various perquisites such as painting boat and boathouse, refitting rigging, examination of moorings, etc., for all of which special scale allowances are made. The motor mechanic of a motor lifeboat on the other hand is, in nine cases out of ten, a permanent employee on a fixed salary, and his duties require him to be in daily attendance at the boathouse. This as well as the position of coxswain is a much sought after post.

The coxswain, second coxswain and bowman, are appointed by the local committee, but the men must always be consulted in the choice of their coxswain. This is a valuable rule, as it is fairly certain that men who are willing to risk their lives in saving those of others, will take good care that their coxswain possesses all the necessary qualifications for this vitally important position.

It is a sad fact that difficulty is being found at a few stations to get an efficient crew. The advent of the internal combustion engine is gradually bringing into existence a new race of seamen, many of whom have not the experience, and, sad to relate, the stamina of the older generation. Whilst at present the Institution has not suffered severely from the shortage of men, it is a problem which may, it is feared, become formidable in the future. The only real solution is, of course, permanent whole time crews, but this would involve an expenditure which would seriously cripple the funds of the Institution. It seems probable that the future will witness a considerable reduction in the number of lifeboat stations, and the provision in lieu, of a cruising fleet of large boats manned by permanent crews who will put to sea in bad weather and patrol dangerous stretches of coast. This system is, I believe, already in force in Norway.

With Great Britain the time is not yet come to make any drastic change. We have still the men and means to carry on; a sufficiency of the former and as regards the latter—well we could do with a bit more! But I believe that even though the Nation should fail them financially, these men—modest heroes all—will never fail in their chosen task so long as we can supply them with the best boats and equipment that science can devise and money can provide.

The next chapter will be devoted to a necessarily brief description of these boats and equipment.



THE BRITISH D. E. LIFE BOAT ENGINE

II.

The present fleet of the British Lifeboat Institution is composed of one steam tug, two steam lifeboats, forty motor lifeboats and 192 pulling and sailing lifeboats, making a total of 235 boats designed and operating for the sole purpose of saving life.

In addition to these there are thirteen motor lifeboats under construction including a sixty-foot twin-screw boat of a new design intended for service at the entrance to the River Mersey. Further motor boats will be laid down as opportunity offers and the pulling and sailing fleet will be materially reduced.

Broadly speaking, these boats whether pulling and sailing or motor, may be divided into two different types: viz., self-righting or non-self-righting.

A Forty Foot by Ten Foot Six Inch Self-righting Boat

The self-righting qualities are attained by the adoption of high endboxes and a heavy iron keel, and before despatch to her station every boat, whether fitted with a motor or not is capsized. She must be able to right herself with her full crew on board (weights equivalent to the weight of a man are lashed to the thwarts for testing purposes), and must further right under full sail but with the fore sheet not belayed. In the case of a motor boat she must be capsized with her engine running and this must cut off when an angle of sixty degrees is reached. The reason for this is obvious; if the boat capsizes and the crew are thrown into the water, it is necessary to ensure that their boat does not run away and leave them, metaphorically speaking, stranded.

The non-self-righting type was designed by the late Mr. Watson, Consulting Naval Architect to the Institution, and is known as the Watson type. Roughly speaking it may be said that with large boats intended to put well out to sea, it has been found better to set aside the self-righting principle in favor of great buoyancy, stability and speed. The photographs reproduced indicate very clearly the difference in appearance of these two types. Both have their partisans, and the Institution wisely leaves it to the men who man the boat to select the type they prefer.

The largest motor lifeboat actually on the coast at present, is of a type known as "The Norfolk and Suffolk," specially designed to suit the requirements of the men of these counties. She is a non-self-righting boat, it having been found impracticable to design a suitable self-righting boat larger than 40′ x 10′6″.

As may be imagined, all motor lifeboats are very wet and uncomfortable, and in wintry weather rescuers and rescued are liable to have a very trying time of it. With a view to overcoming this defect, the Institution has finally decided to install a cabin in the larger boats and the first of this cabin type is now approaching completion. Such a boat will accommodate on deck and below a total of about fifty persons.

The smallest motorboat, 35′ x 8′6″, of which at present two only have been built, is designed to launch off a carriage and has thus to combine lightness with strength. This boat with crew and equipment weighs about four tons, as compared with the eighteen tons of a 45′ x 12′ 6″ Watson type.

Whilst on the subject of carriages, mention must be made of a

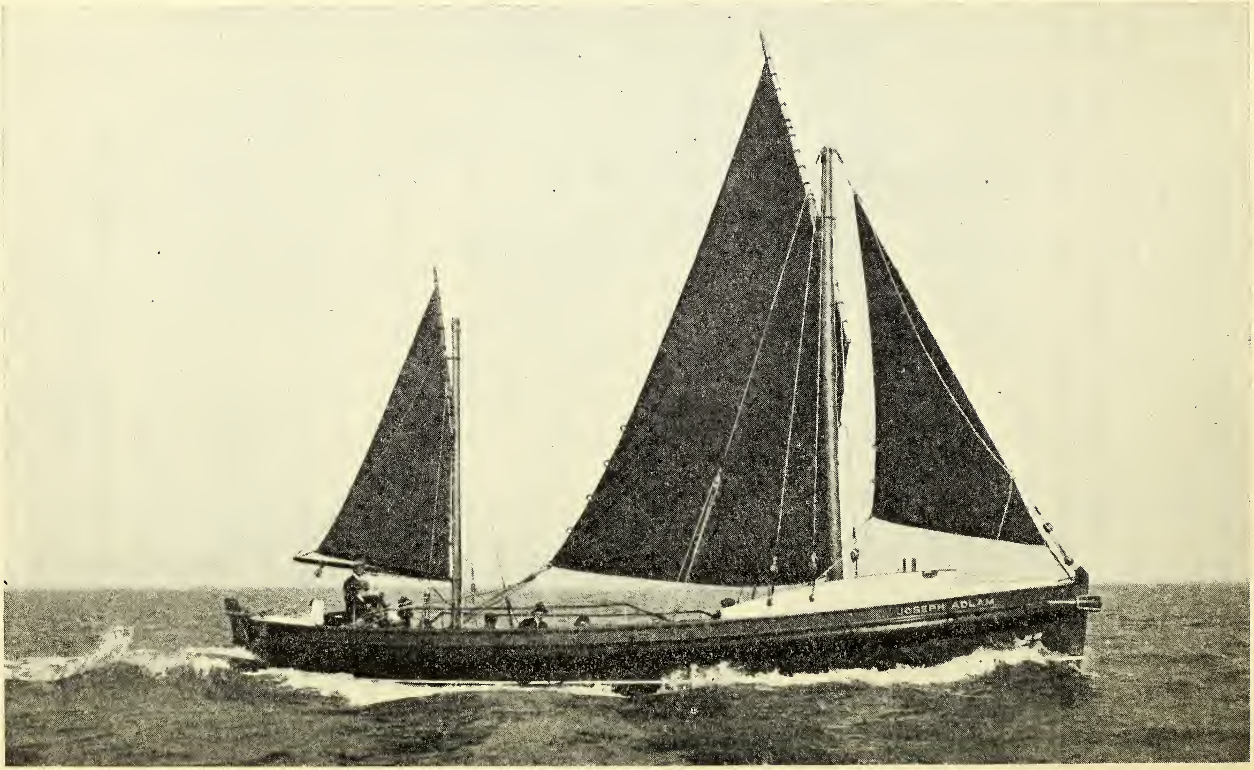
recent innovation for launching pulling and sailing boats off carriages; viz., the Caterpillar Tractor. This bids fair to revolutionize all previous methods of launching, and, curiously enough, its adoption is the result of one of the lessons learned in the war. The machine at present used is an army type, 35 H. P. Clayton Tractor, which has been specially adapted for surf work. The magneto and carburetor are enclosed in watertight boxes with breathing pipes which are led vertically upwards so as to be clear of breaking waves and spray. Sparking plugs and all vital parts are similarly protected with the result that it has been found possible to turn the machine into the sea to a depth of 5′ 10″ before the engine ceased to function.

The chief difficulty has not yet been satisfactorily overcome, and that is to find a spud which will give the tractor a good grip in sand, and yet permit the boat on its carriage to be dragged along hard and rough roads at a high speed without undue strain on the tractor through vibration, or injury to the spuds.

The procedure in launching is for the boat on its carriage to be dragged by the tractor down to the beach and pointed bows to seaward. The tractor is then unhitched and reversed so as to push instead of pull. The boat on its carriage is then pushed into launching depth and launching "falls" are attached to the tractor which is then again unhitched. The tractor moves astern, and as she does so stoppers and securing chains are let go and the boat is hauled off its carriage, after which the latter is dragged back to shore.

Whilst we have yet a great deal to learn about this system of launching, it has already proved itself superior to the old method, whereby from eight to ten horses had to be employed.

To revert to the motor lifeboat; a boat which it is hoped will show radical superiority over all previous types is now under construction for New Brighton, at the entrance to the River Mersey. With a length of sixty feet, a beam of fifteen feet, and a draft of four feet six inches, her displacement will be about forty tons. She will be fitted with twin screws, driven by two six-cylinder seventy-five h. p. engines of a new and special design which it is intended to adopt in all her successors. With her engines developing 150 h. p. the boat will have a speed up to 10 knots an hour, and her radius of action will be 100 miles, or 150



A Forty-five Foot by Twelve Foot Six Inch Watson Type Life Boat, Non Self-righting

at cruising speed. Unlike previous types, her sails will be of an auxiliary nature only, and she will depend for her propulsion on her motors. It is to be noted that the new and more powerful engines will give her a great reserve of power which will enable her to maintain her maximum speed in weather conditions that would materially reduce that of any other motor lifeboat. Built almost entirely of a double thickness of teak, with light mild-steel bulkheads, she will have nearly 100 buoyant air cases, each virtually a water-tight compartment, making her practically unsinkable. Each motor will be in a separate water-tight compartment. Besides carrying a line-throwing gun, she will have a searchlight by the mast and a screen shelter for the helmsman. Under the triangular sail amidship will be stretched a net, so that when alongside a vessel high out of the water people will be able to jump into her much more easily and quickly than is at present possible.

The line-throwing gun referred to is the outcome of years of patient experiment, in the course of which every known type of apparatus has been tested. None, however, fulfilled the Institution's requirements in their entirety. Finally in 1920 the well known Birmingham Small Arms Company took up the problem and tackled it with great enthusiasm. The last few weeks have witnessed final success and the Institution now possesses a shoulder gun of little more than the weight of a rifle which will throw with perfect accuracy a one-fourth inch line a distance of sixty to ninety yds., according to the state of weather, this being the maximum range required for lifeboat work.

This weapon will, it is hoped, prove an inestimable boon in shoal water, or where the lifeboat is unable to get alongside the wreck owing to weather conditions. The sixty foot boat will carry a mounted gun with increased range, but for smaller boats the shoulder gun with its increased portability and simplicity is more suitable.

For the rest, the equipment calls for little comment since it is substantially the same as that carried in the United States boats.

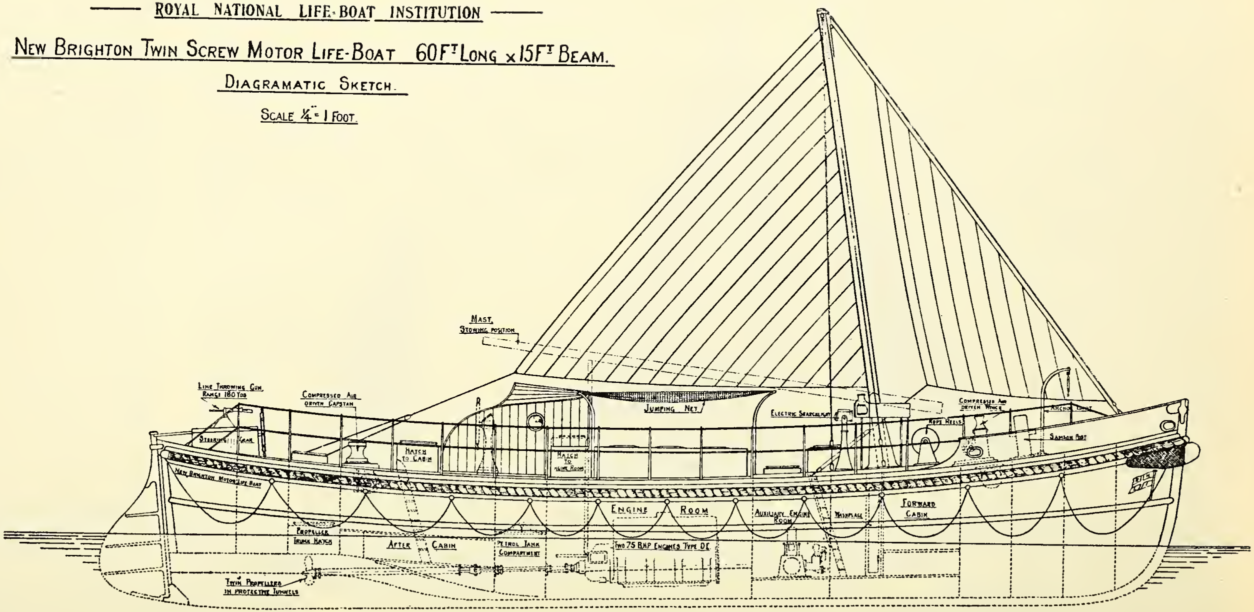
Your readers, or those of them interested in the marine motor, may be glad of a few details of the new lifeboat engine referred to above. This engine will not only be supplied to the sixty foot boat, but will in future be the standard engine for all boats of

ROYAL NATIONAL LIFE-BOAT INSTITUTION

NEW BRIGHTON TWIN SCREW MOTOR LIFE-BOAT 60 FT LONG x 15 FT BEAM.

DIAGRAMATIC SKETCH.

SCALE 1/4" = 1 FOOT.



and above 45 feet, and I hope it is not claiming too much to describe it as the "Rolls Royce" of marine engines with a few features of the "Ford" thrown in!

The design of this new engine by the Lifeboat Institution was only decided upon after many years of endeavor to obtain a really satisfactory petrol engine in the ordinary way of trade. By a satisfactory engine is meant an engine: (1) that will run at full load for long periods at a time; (2) that is spray proof; (3) that will stand damp and varying climatic conditions; (4) that will lend itself readily to examination, cleaning, and adjustment.

All the above are really essential points for any marine engine, but when the Institution decided to design an engine themselves they naturally arranged to go further than this and to make an engine that was as near the ideal as possible from the point of view of the ordinary marine motor, and yet which embodied certain features desirable in a lifeboat engine. In an endeavor to achieve this ideal, a considerable departure has had to be made from the orthodox petrol engine design, especially as the engine has to be a much larger production than is usually found.

To provide the requisite power, it has been found necessary to provide six cylinders, each having a bore of five and a half inches and a stroke of seven inches, the designed horse power of this engine at 800 r. p. m. being seventy-six.

To ensure rigidity, the body of the engine is a single casting reaching from the top of the cylinders to the bottom of the sump or lowest part of the engine. This forms a substantial box girder, rigidly tied by two plates at the top, one forming the entablature and the other the bottom of the water jacket.

Six holes are formed right through these plates to accommodate the actual cylinders, which are plain tubes with a flange at the top, and they are forced through these two holes and thus pass through the water jacket.

This arrangement provides for both rigidity and renewal of liners if necessary, and further, provides a symmetrical working cylinder that can be thoroughly examined before it is inserted into position.

It was thought that, if the "motions" as they used to be called, that is to say, the crankshaft, connecting rods, etc., were made of

substantial dimensions and of the correct material, they would hardly ever require examination, much less adjustment, and, therefore, a very large crankshaft made of nickel chrome steel was selected, and as the bearings are pressure cast whitemetal in bronze shells, the only result of wear is to produce a fine polish on the bearing surfaces.

No amount of care can eliminate possible trouble with such matters as valves, ignition gear, etc., and as the adjustment of such parts, and their thorough examination should be carried out every year, the whole of what may be termed, in comparison, delicate parts, are located on the cylinder head.

This head covers the whole of the six cylinders; the valves being inverted and all on the center line, while the cam shaft, a very substantial affair, is arranged immediately above the valves, and the cams operate direct on to the flat tappet heads. There is a separate ignition shaft with a definite timing adjustment, both shafts being carried on the same detachable bearings.

The valves are made of cobalt chrome steel, and are arranged with very heavy stems and two springs to each valve.

There are two ignitions, high tension and low, and an ignitor in the side of the combustion chamber carries the high tension and low tension plugs, and as both of the ignitions are driven from the special shaft, the timing adjustment is synchronized.

In the ordinary way, it would be somewhat of an undertaking to remove such a head, as it would necessitate the removal of induction and exhaust pipes, water connection and oil pipes, and the remaking of these joints is always a doubtful proceeding. In order to obviate this, a very novel arrangement is employed which entails carrying the exhaust and inlet manifolds in the actual water jacket, providing ports to transfer the gases to the head, and also arranging ports for the water and oil.

In order to keep the water from coming in contact with the main cylinder head joint, short spigot tubes with rubber rings are arranged, and the result is that after disconnecting the two unions carrying the high and low tension leads to the engine, and letting go the bolts, the head can be removed and placed on the bench.

In this position everything is in view, and after cleaning and adjustment, the cam shaft can be rotated by hand, the operation of the valves noted, and the ignitions, both high and low adjusted and tested.

There are two separate induction systems and two carburetors, thereby preventing a total stoppage of the engine should a jet become choked. The carburetors are water-tight, and an air pipe is led up to whatever height may be necessary.

The all important question of oiling is dealt with by providing a large oil sump and a very large gear pump.

Next to the pump is a relief valve which returns the surplus oil to the sump, and the oil, after passing through a duplex filter, is distributed to every moving part of the engine, all bearings being pressure fed. A separate pipe is carried up to the head and all the cam shaft and ignitor shaft bearings are fed, while each cam has a triple pin lubrication system. At the very end of the circuit is a further relief valve set to blow at five pounds, and there is a pipe led from this point to a pressure gauge.

The oil and water pump spindles and drives have a branch from this service, and the whole of the reverse gear is lubricated by this means.

In the case of a lifeboat, it is found necessary to cool the engine with an enclosed circuit, fresh water being used, and this water passes through coolers in contact with the sea. This keeps sand out of the water jackets and it also obviates danger from obstructions and corrosion.

It is essential that an engine should have a constant temperature in the water jackets, and to this end a thermostatic valve is fitted which regulates the amount of cold water admitted, by by-passing some of the hot water to the suction of the pump. This apparatus, which is very simple and robust, is set for 160 degrees F. and this temperature is maintained within a few degrees.

The engine is made water-tight by enclosing the flywheel within the body of the engine, by passing the shaft through a gland at the after end and by providing all control rods, etc., with glands. The head is protected by a light cast cover which screws down with four hand screws on a special oil proof rubber joint.

Attached to, and built with the engine, is a reverse gear and a substantial ball thrust block, and the shaft operating this gear carries a cam which opens the throttle to any desired amount when the gear is ahead or astern, and which closes it, also to any desired amount, when it is neutral. This gives absolute control of the engine by the manipulation of one hand wheel half a turn each way.

The engine is started by means of a small two-cycle engine on the lines of a bicycle motor, built into the engine. It can also be started and readily cranked by hand.

Although it is not expected that the crankshaft will require much attention, an hour's work will remove all the pistons through the inspection doors in the crank chamber and all the main bearings can readily be removed in the same way.

The performance of this engine has been very satisfactory. The maximum horsepower developed at eight hundred revolutions is ninety, and the engine will run indefinitely without load at 130 r. p. m., and can be run at twelve or fourteen hundred; at full load and eight hundred revolutions, a coin will remain on edge on the number plate fixed to the top of the cylinder head cover.

Sixteen of these engines are being built at present and of the four completed, the results have been identical, and including the experimental engine (which had a 1,000 miles sea test) no mechanical defects have developed.

I have trespassed too greatly, I fear, on your valuable space. There remains for me only to say—Heaven forbid any of your readers should be put to the necessity of calling for the aid of a British lifeboat! Should, however, that unfortunate contingency arise, I hope and think that "come fine come storm" their appeal will not remain unanswered. Nor even will it be necessary for the readers referred to to possess the qualifications held by a gentleman depicted some time ago in the pages of *Punch* as clinging to the rigging of a shipwrecked vessel and hailing an approaching lifeboat with the words: "Hi! save me first! I'm a subscriber!"

DISCUSSION

We Must Have It!

(See page 949, June, 1923, PROCEEDINGS)

CAPTAIN RALPH EARLE, U. S. NAVY.—For many years the writer has felt that one of the things the Navy badly needed was a Gunnery School. It is therefore a satisfaction to see that there still exists in the service some sentiment for the establishment of such a school.

Some years ago detailed plans for such a school, with courses of instruction listed in much detail were submitted to the Department together with a suggestion as to several then available sites for such an establishment. Courses were laid out so as to provide sufficient time for commanding officers, gunnery officers, division officers, and all rated and non-rated men of fire control groups. It is realized that there are many difficulties confronting the establishment of such a school, especially those dealing with the availability of enlisted personnel. It is quite possible to obtain a site that will be convenient, and the necessary small allotments of funds required. Existing buildings could be used.

It is a matter of securing the officers and men requisite for administering and attending the gunnery school, that the difficulties encountered in its initiation present the major obstacles to its establishment.

A captain desiring to familiarize himself with the working of gun and torpedo control on board ship would be enabled to see the entire system working by visiting such a school but for a few days. Selection would be made from the crews being assembled for all classes of ships for men to be detailed in fire control parties, and here they would be properly trained. For instance, men who could not talk over the telephone would be eliminated almost immediately after reaching the school. Damage to valuable and important instruments in the fire control, when once installed upon ship, is fatal; and by the use of the school all such would be nearly eliminated, and confined entirely to sets installed at the school, where damage would be least harmful to the service. Then, due to the careful training of those soon to become responsible for them on board ship, and to the knowledge on the part of those using them gained by the training at the school, mishaps in the battle fleet would be nearly prevented. These points are worth careful consideration, and it is believed that the results secured would well repay the effort spent upon the school.

It has been found practicable to utilize some of the fire control installation at the Naval Academy, for the education and instruction of personnel in the Navy from time to time. While the layout and facilities for such instruction there are not comparable with what one would expect in the

gunnery school, nevertheless they are extremely useful to the service at large, and are availed of quite frequently—one case being that of the *Idaho,* which ship sent her entire fire control group, comprising some four officers and fifty men, to Annapolis for a week of training. Upon the *Idaho's* commissioning, her fire control operated like a well-trained football team, being efficient long before gun crews became so.

The gunnery school is one of the important missing links now existing in the instruction of the Navy's personnel, one which a great many officers believe should be supplied at an early date.

The fact that the Navy is being kept at a certain size, through treaty limitations, emphasizes the fact that what we do possess of the navy should be of the very best. Since the close of the World War, the shortage of officer personnel available for experimentation and research has been so acute that it may well mean that many of the lessons available to us, as a heritage of the World War, cannot be made of practical application, and therefore will never be developed and applied. The officers of such a school could well correct, in large measure, this deficiency, and as they would be in a position to assist in the progress of the Navy in gunnery, much would naturally be expected from them.

In conclusion, I believe that such a school could be established should the service wish it, and that the benefits accruing to the Navy from it will be far greater than any now foreseen.

A Proposed Modification and a Proposed Palliative for the Personnel Selection Law

(See page 965, June, 1923, Proceedings)

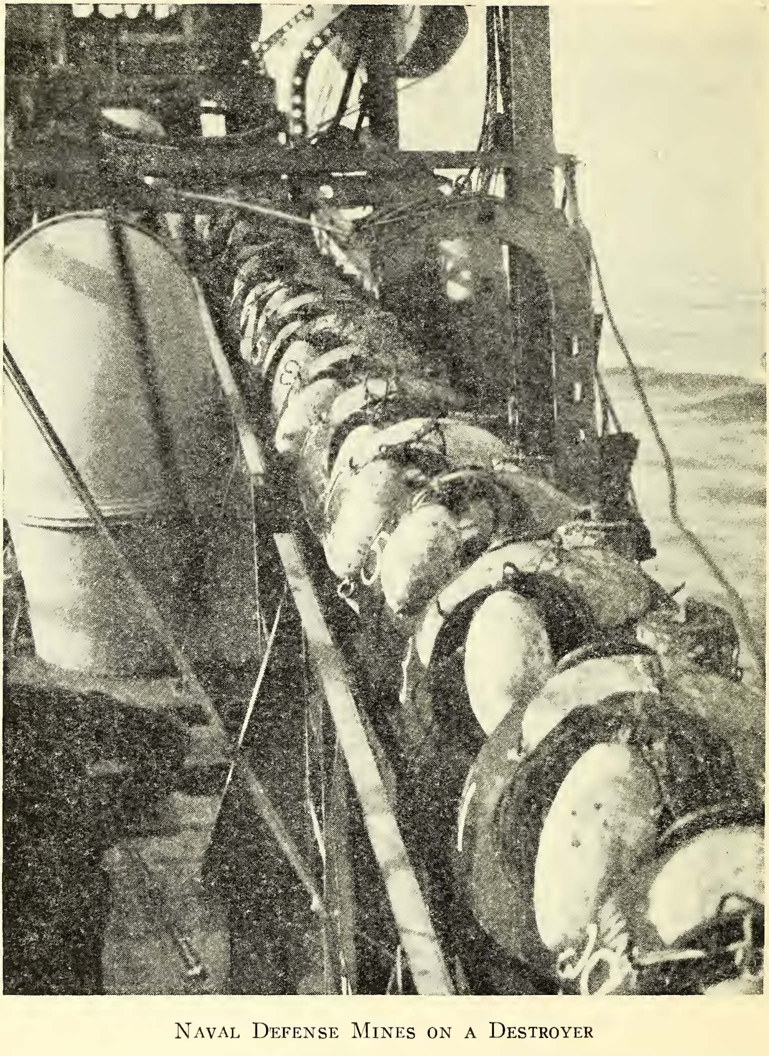
Lieutenant Commander F. S. Craven, U. S. Navy.—Commander Babbitt produces charts indicating the form of stagnation at the heads of certain grades which probably will result from the continued application of the existing personnel selection law. This is a bad condition which results from one of the imperfections of the present law.

Commander Babbitt further offers, on page 967, two suggestions for overcoming this condition. These propositions appear objectionable to me. The second one is the less objectionable, but it would bleed the Service of too many energetic and desirable officers of middle age who, perhaps despairing of ultimate selection or else desirious of a home life, would be only too glad to accept the proposed retired pay which would enable them to make a start at the bottom in commercial life with a safe future.

The first suggestion, under the heading "Proposed Modification in Present Act," would only make worse an already bad condition, in that it would practically eliminate entirely real selection up. No selection board would be willing to go well down in the list of eligibles if the automatic result, as proposed by Commander Babbitt, would be to retire all those above the lowest selected officer who were not selected. Commander Babbitt's plan would harden into standard practice the present tendency

exhibited by selection boards to retard by selection instead of promote by selection. Examination of the work of most recent boards will reveal that with the exception of a few cases the results have been promotion of the senior elegibles except those retarded, together with a few minor inversions of seniority. Incidentally, the latter are an unnecessary irritant and are an additional reason why there should be a change in the existing law.

What we require is a method of promotion which will not deny advancement to the average officer, which will speed up the advancement of the few exceptionally able officers, and which will eliminate entirely those considered unfit for promotion. Only exceptionally able officers should reach flag rank, so perhaps Commander Babbitt's first suggestion would work for those officers in the grade of captain who are passed over in making the selection for rear admiral.



Naval Defense Mines on a Destroyer

PROFESSIONAL NOTES

PREPARED BY

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GENERAL ARRANGEMENT

GREAT BRITAIN

THE NEW SUBMARINE.—Much interest continues to be taken in the mystery submarine launched at Chatham on the sixteenth inst., and now fitting out for sea. Several of the papers persist in crediting her with a battleship armament and steam machinery, but both stories are disbelieved in well-informed circles. A paragraph in "Lloyd's List" points out that the appearance of the hull when seen after launching was inconsistent with the theory of a steam installation. Furthermore, "the reversion to steam as a prime mover in this class of vessel would obviously be a retrograde step, and the fact that *X-1* was specifically designed to embody the latest principles of submarine construction, both in hull and machinery, is in our view prima facie evidence that she will be propelled by internal combustion machinery."

So far as is known, this vessel, like the *K*-boats, is intended to maneuver as an integral unit of the battle fleet, duties which call for high speed and the best sea-keeping qualities. At the time the *K*-boats were designed, Diesel engines had not been sufficiently developed to generate power required for propelling a large vessel at 24 knots, but considerable progress has been made since then, and it should now be feasible to attain great surface speed with internal combustion machinery. The drawbacks of steam in under-water vessels are so serious that the system appears to have been universally abandoned. The French kept to it longest, but even they are now refitting their largest steam-driven boats with oil

motors, and our *K*-boats are rapidly disappearing from the active list.

Quick diving and great cruising endurance, two features of special value in submarines, are both sacrificed when a steam plant is installed. If the *X-1* is really designed for work with the fleet, she will be likely to carry a powerful torpedo armament, which would be more effective than a big gun. We are therefore inclined to agree with Lloyd's organ that the gun power of *X-1* will be found to resemble that of the German *U*-cruisers, which carried several 6-inch guns, "rather than mark a development of the heavy caliber armament which distinguishes our submarine monitors of the *M* class."—*Naval and Military Record,* 21 June, 1923.

British Government Calls for Three Types of Machines to Build Up Empire Fleet.—London, June 15.—It has been announced that the Air Ministry intended to invite aircraft firms to design and build experimental aeroplanes for long-distance services, and some very wild speculations have been made as to what the characteristics of these machines will be. It is now possible to state some of the actual requirements specified by the Director of Research of the Air Ministry, and from them to deduce the work which the machines will be expected to carry out. Writes F. A. deV. Robertson in the *Manchester Guardian.* Three types are called for:

1.—An aeroplane with a single engine for transport in Europe.
2.—An aeroplane for transport in the Middle East.
3.—A three-engined machine for imperial communications.

Thus the three stages, Croydon to Egypt, Egypt to India, and India to Australia, will be provided for. The most notable feature of the specifications is the attempt to achieve safety and reliability on the second and third stages by the use of three engines in a machine. At the last air conference Sir Geoffrey Salmond, air member for supply and research, expressed the opinion that this arrangement was the best way to avoid forced landings. He is almost certainly right, and one can only regret that in these specifications he has not gone a little farther than he has done, by making three engines obligatory instead of optional for the Middle East machine. It will not do for important mails from India to be delayed by a forced landing in the midst of the Arabian Desert. A few such delays would soon shake the faith of the Calcutta merchants in the air mail.

The "European" Type

The first, or European, machine may be driven by any approved type of British engine, only one engine being allowed. The machine must have a crew of two, but the actual number of passengers will naturally depend upon the engine chosen by the designer and the general design of the machine. The only stipulation made is that one ton of passengers and baggage must be carried for every four hundred horsepower. The cabin of the machine must be easily convertible into an ambulance, and one rather wonders why the same stipulation is not also applied to the two other types. The aeroplane must be able to float for a considerable time on calm water. It must carry fuel for a flight of three and a half hours at 100 m. p. h. Its speed must range from 110 m. p. h. at a height of 3,000 feet to a landing speed of forty-five miles an hour.

"Middle East" Type

The aeroplane for the Middle East is not required to be used as an ambulance, though it is on record that the life of an important sheik was once saved by flying him to Bagdad for an appendicitis operation. The aeroplane may have one or three engines (the system of two engines is wisely barred), but the total horsepower is not to exceed 1,000. It looks

as if the director of research had the Napier 1,000-h. p. Cub in his mind, but if the rule is rigidly enforced it would exclude an arrangement of three Rolls-Royce 360-h. p. Eagles, three Bristol 400-h. p. Jupiters, or three Siddeley 350-h. p. Jaguars, any one of which combinations might well seem attractive to a designer. The machine must be able to fly level on two-thirds of its full horsepower when carrying three-quarters of its disposable load. This Middle East machine must be specially designed to withstand great variations of temperature and humidity, and metal construction is considered preferable though not essential.

The machine will have a crew of two and must accommodate not less than eight passengers, allowing 236 pounds per passenger with his baggage. Elaborate arrangements for the comfort of the passengers are required. A fan must drive air through a screen down which water will constantly drip, an icechest must be carried, and there must be cooking arrangements as well as a supply of drinking water. Long flights are contemplated, and the machine must be able to fly for 500 miles at full throttle at a height of 10,000 feet against a wind of 30 m. p. h. The top speed at that height must be 95 m. p. h., the landing speed 45 m. p. h., and the machine must pull up in 200 yards.

The "Empire" Type

The machine for Empire communications must have three engines, all of one type, and a total of 2,100 h.p. is allowed. Perhaps the Director of Research has in mind a machine with three Rolls-Royce 650-h.p. Condor engines. No doubt that monster will come in time, but at present the traffic between India and Australia would hardly justify it, and the earlier types will probably have smaller engines. The machine must be able to fly level carrying three-quarters of its disposable load on two of the engines. The top speed at a height of 10,000 ft., need not be above 90 m. p. h., and a landing speed of 50 is allowed, provided that the aeroplane pulls up in 200 yards. The provisions for cooling, etc., are similar to those of the Middle East machine. The Empire machine will carry a crew of four, and sleeping accommodation must be provided for two of them. Passengers will be allowed less baggage than in the Middle East by 26 lb. each. The specification says that as many passengers as possible (in proportion to the horsepower) are to be carried. Petrol must be taken for a flight of 1,300 miles at a height of 10,000 feet against a wind of 15 m. p. h.

This appears to be a very sensible outline of an aeroplane for use over the bush of the veldt, where it is not always easy to keep the surface of a large aerodrome in good order. Very great speed is not necessary where train services are either poor or non-existent. When flying over the sea, as along the East Indies archipelago, the three engines should make forced alightings impossible, and therefore there is no need for flotation gear.

In the case of all types, metal propellers must be used, and the engines must be silenced. All tanks must be self-sealing unless they are placed under the top planes in such a position that any escaping petrol will be blown clear of the machine. These last provisions will greatly minimize the danger of fire.—*Boston Transcript*, 28 June, 1923.

An Air Policy at Last.—Much satisfaction has been caused by the Prime Minister's statement on air policy. Whether the expansion of the Home Defense Air Force to fifty-two squadrons is sufficient to make us safe from attack is a question on which there will doubtless be considerable debate. The really important point is that the Government has at length adopted a definite policy in regard to air defense. They are now pledged to the principle that, "in addition to meeting the essential air

power requirements of the Navy, Army, Indian, and Overseas commitments, British air power must include a Home Defense Air Force of sufficient strength adequately to protect us against air attack by the strongest air force within striking distance of this country." This is, in effect, the one-Power standard, which we have always held to be minimum requisite for safety. Defense, not defiance, is the basic idea of our new policy. The addition of thirty-four machines to the authorized strength of the Royal Air Force represents the first step toward the attainment of the new standard.

To talk of "a new competition in armaments" in this connection is palpable nonsense. Thanks to pro-German propaganda, an impression has got about that France since the war, has been feverishly piling up air armaments, when the simple fact is that she has effected a sweeping reduction in them. At the time of the armistice she had 3,300 aeroplanes; today she has exactly 1,260, or nearly two-thirds less. The end of the war found this country no less strong in the air than France. But whereas we, in an access of blind economy, practically "scrapped the lot" and generally behaved as if air power had become a negligible factor, France proceeded more cautiously. She endeavored to modify her air force to post-war requirements instead of getting rid of it altogether, as we so nearly did. The millions we are now called upon to pay for rebuilding our shattered air fleet constitute the penalty for that mad orgy of destruction in which the late Government indulged.—*Naval and Military Record,* 4 July, 1923.

Bases and Ships.—It is so much the custom to reckon naval strength in terms of ships and men that the other component elements are apt to be ignored. All the same, it is a fact that Britain owes her commanding position at sea largely to the existence of a chain of bases which enable her fighting ships to operate in nearly every part of the Seven Seas. It follows, therefore, that the creation of a new base is equivalent to the building of many new ships. This is especially true in the case of Singapore, concerning which we find some very sound views expressed by the New York *Army and Navy Journal.*

A base within reach of a theater of operations, we are reminded, multiplies the number of ships which can be constantly maintained in active service in that theater. "It may easily result in the exertion of greater naval power in a given theater than the alternative of building more ships, which must frequently return to a distant base for replenishment of fuel and supplies. What counts is not the total number of ships afloat, but the proportion of them which can be maintained at the front. A convenient base may greatly increase the latter number." Misreading dollars for pounds, our contemporary states that £40,000,000 is to be spent on Singapore; but the fact that this is more than four times the actual sum it is proposed to spend only emphasizes the *Journal's* argument that the development of the Eastern base will reinforce the British Navy to a far greater extent than if the money were invested in new ships.—*Naval and Military Record,* 6 June, 1923.

The Cost of Singapore.—Further details of the plans for developing Singapore which have been given in Parliament show that the new base is to be made fully capable of looking after the needs of a great battle fleet. The graving dock, on which about £1,000,000 is to be spent, will be sufficiently large to take two capital ships at a time. It looks as if this extension of the original scheme has been decided upon at the last moment, for only a week beforehand the cost of the projected dock was returned as £400,000, this figure, as the First Lord explained on Wednesday, having had reference to a dock able to take one ship of the maximum

size permissible under the Washington agreement. The decision involves an increase of £600,000 in dock costs alone. We notice, too, that the First Lord now roughly estimates the total cost on Navy Votes for the next ten years of the dockyard and naval base at Singapore at £10,500,000, instead of the £9,500,000 which was mentioned a few weeks ago.

An important point was raised by Lieutenant-Commander Kenworthy, who wished to know whether the scheme would entail expenditures beyond that which comes on the Navy Votes. The First Lord replied that if additional fortifications were necessary they would come on Army Votes, but no such outlay was contemplated. All the same, we shall be surprised if a demand is not raised for stronger defenses at Singapore as soon as it has been converted into a great naval base, for the means of defense now existing there are notoriously inadequate. If the total bill for Singapore does not exceed £10,500,000 the country will get off cheaply. But experience with other naval bases, including those at Dover and Gibraltar, warns us not to accept these "rough estimates" too literally, especially when they refer to work extending over so long a period as ten years.—*Naval and Military Record,* 4 July, 1923.

Giant Floating Docks.—The destination of the large ex-German floating dock now being reconditioned at Chatham is still a matter for conjecture. It was thought at first that this huge structure would be sent out to Singapore, but there is now a stronger probability that it will go to Malta. There is but one dry dock at this base capable of taking the present battleships of the Mediterranean Fleet, and it will not accommodate vessels of the *Royal Sovereign* class, which are expected to join that command in the near future. The original beam of these ships was 88½ feet, but the fitting of anti-torpedo bulges has increased it to nearly 102 feet. This alteration has profoundly affected the question of docking facilities at the naval ports, very few of which are now able to execute underwater repairs to our largest capital ships. It is essential, however, that all vessels in the Mediterranean should be kept in efficient condition without leaving their station, and the only way to do this is to provide them with docks.

As the needs of Malta are more urgent than those of Singapore, the ex-German dock is likely to be sent to the former base as soon as it is ready. Built in six sections, it has a lifting power of 40,000 tons. The length over all is 700 feet, but this may be extended by adding one or more sections. The clear entrance width is 700 feet. In home waters a much larger dock will soon be available for H.M. ships in an emergency. This is the colossal structure for Southampton, which is to be delivered in a few months' time. Its length is 960 feet and its lifting power 60,000 tons. This type of dock for very large ships has not hitherto enjoyed much favor in England; but it has certain great advantages, such as mobility and cheapness, compared with dry docks of equivalent dimensions. Sooner or later, no doubt, our principal bases abroad will be equipped with floating docks large enough to take the heaviest battleship.—*Naval and Military Record,* 27 June, 1923.

Salvage Operations to Begin at Scapa Flow.—Salving operations on the sunken German Fleet at Scapa Flow are to be begun at an early date.

A Glasgow chartered accountant has completed negotiations with the Admiralty for the purchase of part of the scuttled fleet.

Forty-nine vessels are at Scapa, but it would not be a commercial advantage to raise some of them.

The *Hindenburg* and the well-known *Seydlitz* are among the ten capital ships.—*Naval and Military Record,* 6 June, 1923.

SALVING SCAPA DESTROYERS.—The Admiralty state that the contract reported from Glasgow for the salving of German vessels at Scapa refers only to four torpedo boats of the *V* class. There is no official knowledge of any attempt to raise other of the sunken ships.—*Army, Navy, and Air Force Gazette,* 9 June, 1923.

COALING OF THE "GOEBEN" AND "BRESLAU" DURING WAR.—Mr. R. McNeill (Under-Secretary for Foreign Affairs), answering Mr. Balfour, in the House of Commons yesterday, said there was no reason to doubt that coal was supplied to the German warships *Goeben* and *Breslau* in 1914 by the order of M. Venizelos, but he ought to state that at the beginning of hostilities with Germany, and therefore before giving this order, M. Venizelos went out of his way to consult his Majesty's Government as to the course which he should adopt in such circumstances. After full consideration, the Government suggested to him that he should follow the principle of international law and afford belligerent ships enough coal to take them to their nearest home port. British warships were similarly treated and supplied with coal by the Greeks, who were at that time neutral.—*Naval and Military Record,* 6 June, 1923.

SUBMARINE DANGERS LESSENED.—As the result of fifteen years' experiment and research, there has recently passed through the Patents' Office an apparatus for saving the lives of crews of submarine vessels when, through an accident, they are unable to bring their boat to the surface. It is the invention of Lieutenant C. R. Tribe, R.N. (retired), who formerly served with the British Naval Mission to Greece.

To provide effective means for rescuing the crew of a submerged vessel there is a buoy, which, the *Portsmouth Evening News* states, is ordinarily housed in the hull of the vessel, and which is adapted to be entered by members of the crew and to rise to the surface. The buoy is provided with one or more ballast tanks, which can be pumped out or flooded as desired. A mooring wire, secured to the buoy at one end and to a winding drum in the submerged vessel at the other end, is employed for hauling down the buoy after it has risen to the surface. The machinery for operating the winding drum is contained in a water-tight safety chamber, in which the crew assemble preparatory to entering the buoy through a second water-tight chamber enclosed by the safety chamber. The mooring is employed for effecting telephonic communication between the submerged vessel and the buoy. By this means the crew of a submerged vessel may be saved, one or more at a time, providing, of course, that they have reached the safety chamber before the adjoining compartments are flooded.—*Naval and Military Record,* 6 June, 1923.

GREAT IMPETUS GIVEN MOTORSHIP BUILDING.—Washington, June 22—British shipping circles are much interested in the steady progress of motor-ship building, according to a London report to the Department of Commerce. There is a feeling that the advantages found in this type of vessel offer the best remedy for the difficulties experienced by the shipping world during the last year or two. Figures issued recently show 118 motor ships, aggregating 327,232 gross tons, under construction March 31, 1923. Close to half the total tonnage is credited to British yards, with Germany, Sweden, Denmark and the United States making up the bulk of the remainder.

During the last year launchings of motor vessels from British yards have totaled close to 175,000 tons, and the tonnage under construction at the end of March was 23,000 tons larger than a year ago. Eighty per cent of the tonnage now under way is to be under the British flag. These

facts are regarded as sufficient proof of British leadership in motor-ship construction and British appreciation of the merits of such craft.—*Baltimore Evening Sun,* 22 June, 1923.

FRANCE

Rebuilding the French Navy.—We offer no apology for returning this week to a subject which has been so recently touched upon in these columns—the new French naval program and its effect on the balance of power in Europe. France is at once our nearest neighbor and the greatest military State of the Continent. It is but natural, therefore, that we should feel an interest in the development of her armaments. It is not an interest born of suspicion or fear, because the mass of people in this country still look upon France as our friend, a sentiment we believe to be reciprocated by the French nation at large, despite the bickering of statesmen and the provocative tone of certain journals in London and Paris. There is less occasion to look askance at the present naval activity across the Channel because it is confined to measures which are mainly defensive in character. France does not propose to build a single battleship. Her program is limited to cruisers, destroyers, and submarines, and while two of these types could obviously be employed for commerce-raiding purposes, the design of the vessels themselves, coupled with the inclusion of so large a number of destroyers, is quite consistent with the French assertion that they are intended primarily to guard the sea routes between France and her African colonies. On the security of those routes will depend the strength of the army that France can muster for the defense of her frontiers. Her present naval policy is thus to a large extent dictated by military requirements. Nor do we perceive anything aggressive in the new aviation scheme, which aims at establishing a chain of flying bases round the coast, each with its force of aeroplanes and seaplanes. These squadrons are evidently meant to take the place of the more expensive and less effective shore batteries on which France has hitherto relied as a support to her small fleet in its task of defending the coast.

So far as material development is concerned, the French Navy has remained all but stationary for eight years. During the period of the war every other belligerent Power made large additions to its Navy. This was especially true of Great Britain, which built an amount of new tonnage far in excess of that which was lost. The United States and Japan also completed many new ships, and the fleet that Germany had to surrender was considerably more powerful in all types than that with which she had begun the struggle. Only in France was there an absolute deficit as compared with the pre-war strength. Heavy losses had been suffered without the possibility of replacing them. The dockyards were so preoccupied with the manufacture of munitions and equipment for the Army that they could do very little work for the Navy. And so it happened that beyond a number of small sloops and a few submarines, no fighting ships were laid down in France after the outbreak of war. With the return of peace the Navy found itself in a parlous plight. Its tonnage had been reduced by nearly one quarter, and there was no new construction in hand to fill up the gaps. In swift cruisers, destroyers, and submarines it was even inferior to the Italian Navy, yet these were the very types most needed to make the Mediterranean safe for French communications. Now, France has a great overseas empire: her seaborne trade is no negligible factor in her economic system, and, above all, she has ranked for centuries past as one of the leading maritime Powers of the world. It is no wonder, therefore, that she should desire to repossess herself of a fleet proportionate in some degree, however modest, to her naval requirements. The political necessity for such a fleet was explained

by the former Marine Minister, M. Leygues, when introducing the first section of the new program to Parliament early in 1920. "As a primary consequence of the late war," he said, "the seas are in future to be the arena in which international activities will be developed. According as France follows a policy of activity or effacement in naval matters, so will the consequences be favorable or unfavorable to her."

The new fleet envisaged by the Naval Bill, of which the second part is now before the Chamber, will do much to restore French power in the narrower seas, if not on the broad ocean. Three of the cruisers will be ships of nearly 9,000 tons, but the remaining six may be larger—perhaps up to the Washington limit of 10,000 tons—with an armament of 7-inch or 8-inch guns. The bill provides for twenty-one large destroyers, six of which are already building. These are, in effect, big flotilla leaders of a more powerful type than anything previously designed, having a displacement of 2,400 tons, a speed of 35½ knots, and an armament of six 5-inch guns. Twenty-four medium destroyers are to be added to the twelve already laid down. They will displace 1,400 tons, steam at 33½ knots, and carry four 5-inch guns. The bill comprises forty-six submarines in all, four of which are to be cruisers of large displacement. All but six of the other forty-two are first-class boats, exceeding 1,000 tons. When the above vessels are added to the existing French establishment a very imposing total results—on paper. But the fact is that a great part of the French material now in service is obsolete, and will have become quite useless for war purposes long before the new vessels are ready for sea. If our relations with France were as cordial as they were a few years ago, there would be nothing in this program to cause us a moment's apprehension. As things are, however, the large percentage of submarines has given rise to some comment, and in certain quarters this energetic development of the underwater arm is accepted as a hint that France is prepared, if need be, to avail herself of that "martingale" which in German hands came so near to destroying British naval power. That such an impression prevails at all is largely the fault of Captain Castex, who stated categorically that Germany had an "absolute right" to employ her *U*-boats as she did. But actions speak louder than words, and if France had any designs on British shipping, she certainly would not be content with building only forty-six submarines in ten years, which is the period covered by the program.—*Naval and Military Record,* June, 1923.

French Deputies Vote Ratification of Naval Treaty.—Paris, July 7.—That part of the Washington naval accords dealing with limitation of armaments and capital ships, which created the most bitter opposition in French parliamentary and political circles during the last year, was jammed through the French Chamber of Deputies today in record time by the Poincare-Briand alliance.

The half-hearted opposition from the Socialists and Communists was completely swamped and the treaty was adopted, 460 votes to 106.

The arguments employed by Premier Poincare and former Premier Briand were that France had been treated with the utmost fairness at Washington, that limitation of armaments was temporary, so far as capital ships were concerned, that there was complete liberty of action by France in the building of light cruisers, torpedo boats, destroyers and submarines, and that France's fleet was essentially a defensive one, the speakers pointing out that the country did not need battleships, which were offensive weapons.

"We responded to President Harding's invitation in the spirit with which it was extended; our sacrifices were not heavier than those of the other nations participating in the conference." * * *—*Philadelphia Public Ledger,* 8 July, 1923.

French Navy Notes.—As a consequence of the Washington humiliation and of the many attacks daily being made in popular journals against cuirassés and any kind of armored ships, popular opinion is strongly in favor of an overwhelming aerial force, French supremacy in the air being a solace to French naval decline *(Le Maître de l'air commande la mer),* and it is thought Mons. Raiberti will obtain more easily credits for aviation than for cruiser construction. Commandant Benoit d'Azy, in *Le Matin,* and Raymond Lestonnal in *Le Journal* are weekly deriding Raiberti's cruiser program and urging the immediate creation of a huge aerial fleet, even if it were necessary to do that to sacrifice completely cruiser and destroyer construction. Seaplanes and submarines are held to be the only weapons having any value; battleships, cruisers, even destroyers, are termed vulnerable targets and floating coffins. Slowly, but surely, these exaggerated ideas are getting hold of the popular mind.

The strategic consequence of this French aerial move will weigh heavily in balance of sea power and change conditions of European warfare. Until the advent of the airworthy flying machines, Britannia could truly boast of ruling the waves. Gibraltar acted as a doorkeeper and formidable-looking concierge at the entrance of the Mediterranean. Malta was the imposing policeman proudly standing in the center of the highway to remind passers-by that Britain commanded on the water. Further on, Alexandria and Cyprus were positions of strategic 'vantage; so that nobody could move in the Middle Sea without the permission of Britain, whilst nothing could interfere with the career of English ships, that had the twofold advantage of numerical superiority and of superior bases every few hundred miles. In the Atlantic and Indian Oceans also, businesslike and farseeing matter-of-fact John Bull had mapped out the limits of his naval dominions that extend all over the world.

All this admirable masterpiece of work is now being rendered partly valueless, mostly as the result of the clever Washington diplomacy. From her situation on four seas, France is the country that will gain the most by the creation of coastal air flotillas in a position to command the high sea over a radius of some hundred miles. With an aerial division of some hundred well-trained, heavy seaplanes stationed along the North African border, to be reinforced in case of emergency by as many reserve machines, a hostile battle or even cruiser fleet would commit suicide by following the Mediterranean route. The damage it would inflict on the French would be trifling compared with the risks it would run. When new conditions are envisaged, it is safe to say the command of the sea will in future be decided in the air, and David, frail but bold, will be seen anew to defeat monumental and heavy Goliath.

French faith in battleships is being undermined in every way: in lectures and technical reviews, technical demonstrations are being made by experts (like Ingénieur Bourgia in *Revue de Paris*) of the practical worthlessness of the new 34,000 and 35,000-ton American and British battleships. The impossibility is shown of building, within Panama Canal limits, a fighting ship having anything like armor protection, gun-power, speed, and radius of action needed for modern warfare. The *Hood's* displacement is the minimum necessary. That splendid battle cruiser herself is thought not to quite come up to requirements in what regards immunity against aerial and submarine attack. Of course, these academic discussions do not prevent the Section Technique working ahead and having 35,000 ton battleship designs ready.

But submersible battleships are the type now foremost in the mind of French constructional experts; and the British *S.X1* is considered as the prototype of the gunship of the future, and no wonder. Paris constructors have prepared many interesting designs of similar battle-submarines, especially Ingénieur Simonnot; and four submersible cruisers

are projected, the laying down of which may be hastened by the progress of rival navies. A submarine cuirassé, capable of fighting in a semi-submerged position, her tower alone emerging, surmounted by a quadruple 13.4-inch gun turret, thus offering a diminutive invulnerable target, could tackle at short range, with few risks and good chances of success, any Panama Canal compromise.—J. B. Gautreau in *Naval and Military Record*, 6 June, 1923.

France Sees Menace in German Aerial Plans.—Paris, July 11.—The plan for the reorganization of France's Army of 660,000 men was distributed among the members of Parliament yesterday by Colonel Jean Farry, reporter for the Chamber Army Commission. It contemplates a modernized force based on the lessons of the Great War, with serious attention to new developments in aviation and war materials.

Aviation and gas, the report says, are menaces of the future. Germany, by force of circumstances, must seek her field of action in the air; therefore France must be strong there.

"We are preparing the Army for war, which we are resolved to prevent," continues the report, "but must be ready to strike the first blow. France is now superior to other nations in aviation, except perhaps bombing planes, but she cannot rest satisfied, and must not be content with machine guns in the air, for perhaps the time is near when aerial cannon will appear."

M. Farry presents three conclusions:

First—France, so long as she bases her existence and respect for her rights upon the prestige of her strength, must, because of her will for peace, maintain a strong Army.

Second—That the Army, solidly constructed upon the lessons of the war, ought to be definitely guided toward the utilization of and search for more perfect armaments than those with which the enemy can be equipped, so that the Army may retain that preponderance of force we are going to give it.

Third—The time may come when those who must decide whether to refuse or accept, or even anticipate, war will have to bear a heavy responsibility and, because of the very brutality and efficacy of the first blows struck, it is important to give them instead of receiving them.

The plan, which is the third and final stage in the reorganization of National Land and Air Defense, provides for thirty-two divisions of infantry, each with four regiments and detachments of cavalry, engineers and artillery, the cavalry being reduced to five divisions. Reserves would be formed by thirty regiments of cavalry and forty-eight regiments of artillery. The Army would include also a great number of technical units.

The aviation force would be composed of 132 combat squadrons, seventy-six observation squadrons and thirty-four auxiliary service squadrons with a personnel of about 33,000.

The plan is based on eighteen months' service, each class of conscripts furnishing about 250,000 men, with 100,000 professional soldiers constantly in the Army.

The officers would be reduced about one-fifth from the period before the war, there remaining 107 generals of division and a total of about 33,000 officers.

The total army will number 660,000 and will be composed of 461,000 French troops, 189,000 colonials and 10,000 foreign legionaires. It is proposed to have these Colonial forces more closely interwoven with the French troops.—*Boston Transcript*, 11, July, 1923.

France, Facing Immense Loss, Sells Its Ships.—Washington, June 26.—Facing loss of about 2,000,000,000 francs, or $330,000,000, from construction and operation, the French Government is retiring from the ocean shipping business by disposing of its mercantile fleet to private interests.

The French experience in maintaining a government-owned merchant marine strikingly parallels the experiment of the American Government. Each country built a fleet out of its treasury; each undertook to operate its ships, and each found that this could not be done without heavy deficits, and now each has invited private operators to take the merchantmen off its hands.

The parallel ends there. The French Government found a ready market for its shipping properties. Three-fourths of the entire fleet had been disposed of by the end of March, 1923, and by the end of July all of it probably will have been sold.

America's Experience

The United States Shipping Board, on the other hand, has been unable to find a satisfactory market for its ships. Bids have been asked for repeatedly, but only a small percentage of the tonnage has been sold. Now the board has resolved to stay in the business indefinitely, calling upon Congress yearly to make up operating deficits.

The French, in selling out, were compelled to stand a heavy loss. The French Government fixed as a base price $28 per deadweight ton for a new steamship of 6,000 tons. Prices were graded according to age, general condition and type.

This is slightly under the base price fixed by the American Government on its more recent sales, which have been around $30 a ton.

The facts about the French experiment with a Government-owned merchant marine have been received in trade reports made to the Department of Commerce and have been digested by Eugene T. Chamberlain, for many years Commissioner of Navigation and now the transportation authority of the Department.

French Ship Losses in War

During the war the French merchant marine lost 915,000 tons, or forty per cent of its pre-war tonnage. No new tonnage was built, the French shipyards being almost wholly occupied in making munitions and in repairing damaged Allied ships. In March, 1918, the French Government set aside 500,000,000 francs for the purchase and construction of merchant vessels for Government account, and during the next five months added 350,000,000 francs to that amount.

In addition, French private interests expended about 1,500,000,000 francs for new tonnage, most of it built in England. This amounted to about 1,000,000 dead-weight tons. The Government-owned fleet built and building, by 1920 reached more than 800,000 tons, which since has been increased to about 1,000,000 dead-weight tons.

By 1920 it was found by the French Government that the cost of maintaining a Government owned and operated merchant marine was heavy and that means must be found to dispose of it. In July, 1921, Mr. Chamberlain says, "the Chamber of Deputies decided that the Government fleet could not be maintained without financial sacrifices which the budget could not support," and a bill was passed by the Chamber directing its sale by July 31, 1923.

How Sales Are Made

By an agreement made with the French Government a company was organized by the Armateurs de France, an organization corresponding to the American Ship Owners' Association, to buy Government ships, either on a cash basis of thirty per cent on the execution of the bill of sale and

seventy per cent at delivery, or on credit, with payments of annual installments for eight, ten and fourteen years, the purchaser paying six per cent interest.

Up to January, 1923, the French Government had sold eighty-one Government-built ships, 258,000 tons, for 61,310,000 francs; forty-one ex-German ships, of 234,000 tons, for 36,537,000 francs; 248 steel and cement barges, tugs, sailing ships and wooden craft for 17,474,000 francs—a grand total of 360 vessels, 954,000 tons, for 115,324,000 francs.

On January 1, of this year, the French had ten Government-built ships, of 41,700 tons, valued at 17,924,000 francs; two ex-German ships, of 27,000 tons, valued at 1,985.000 francs; two steel barges and five ex-German steel sailing ships. The fleet therefore had been reduced by the first of the

Including all items, the cost to the French Government for the purchase
year to nineteen ships, of 83,000 tons, valued at 20,835,000 francs.
and construction of its ships stands at 1,300,000,000 francs. Against this may be charged proceeds from sales amounting to 136,000,000 francs, showing a loss of nearly 1,200,000,000 under this head. The loss from operation up to September 1922, amounted to 608,000,000 francs or a total loss of 1,796,000,000 francs up to that time.

Concluding his review of the financial end of the French Government shipping enterprise Mr. Chamberlain says:

"The loss under operating expenses will decrease as the Government fleet passes to the hands of private ship owners, but the ultimate loss to France on the Government participation in merchant shipping will amount to about 2,000,000,000 francs, or about $330,000,000 at the present rate of exchange.—By J. F. Essary in *Baltimore Sun,* 27 June, 1923.

GERMANY

Germany's Sea Interests.—That there are men in Germany who have set themselves the formidable task of reviving national interest in sea power, military no less than mercantile, is evidenced by the mass of literature bearing on this subject which has been produced in the last year or two. The most significant move in this direction is the reappearance of *Nauticus,* the "yearbook of Germany's sea interests," which now resumes publication after an interval of nine years. *Nauticus* was founded in 1899 by Admiral von Tirpitz as a means of educating German public opinion on all matters pertaining to the sea, and incidentally of gaining support for his ambitious naval plans. Although never acknowledged as such, the book was pretty generally known to be a Government publication. Most of the contributors were naval officers on the active list, one of whom, Vice Admiral Hollweg, now retired, is the present editor. Year by year it contained a number of well-written papers on naval, shipping and political questions, together with valuable statistics relating to the world's fighting fleets, commercial navies, and overseas trade. The strongly anti-British bias of German naval policy could always be discerned in the pages of *Nauticus,* and the last few editions before the war were saturated with Anglophobe sentiment. Only a few weeks previous to the outbreak I reviewed the 1914 issue of *Nauticus* in these columns and called attention to the bellicose tone of its references to this country. Was is that the plot against the peace of Europe was then on the point of maturing, and the conspirators no longer felt the need for restraint?

In a foreword to the new edition Admiral von Tirpitz attributes the downfall of Germany to the failure of a great part of its people to understand the sea. This seems rather ungrateful in view of the whole-hearted support which the German people gave to his gigantic naval schemes. No small portion of the book is devoted to propaganda, especially against the Treaty of Versailles. There are the usual fulminations against "England's

brutal hunger blockade," and the editor gravely assures his readers that "the criminal forecast of the *Saturday Review*, in 1898, that 'war with Germany would make every Englishman richer,' has been literally fulfilled!" Of more importance are articles by well-known shipowners and economists on the outlook for Germany's mercantile marine and overseas trade. Most of them write in a spirit of optimism tempered by a sober recognition of difficulties to be overcome. That German shipping has already made a wonderful recovery from the state of ruin into which it had fallen after the war is proved by remarkable statistics. On the outbreak of hostilities the mercantile fleet comprised 5,100,000 tons gross. War losses due to enemy action did not exceed 400,000 tons. Far more serious, however, was the confiscation of German ships in foreign harbors, no fewer than 287 vessels, with an aggregate of 1,406,848 tons, being seized in this way. Ships captured on the high seas after the outbreak of war amounted to 112,468 tons; vessels to the extent of 1,787,320 tons had to be surrendered after the armistice, and a further 808,432 tons were handed over in accordance with the Peace Treaty. The grand total of losses was therefore 4,672,439 tons, which left a balance of only 427,561 tons in German possession.

Such was the position four years ago. Since then the German shipyards have been hard at work, and German capital has been freely employed for the purpose of redeeming ships surrendered to the Allies. These combined efforts have been so successful that the mercantile marine today is nearly six times as large as it was in 1919, the actual total on January 1 this year being 2,451,300 tons. Practically one-half of the pre-war tonnage has thus been replaced, a truly astounding feat for a nation which is supposed to be in the depths of poverty. Writing in 1920, one of the leading German shipping organs declared that under no circumstances could Germany hope to regain half her pre-war amount of tonnage in less than ten years. That was only three years since, yet the German commercial fleet has already attained to half its former size. And as the shipyards are still full of work and new vessels go afloat every week, there seems to be every prospect of the 1914 total being regained in another five or six years at latest.

In the military section of the book there are four articles which have already received a brief notice in this journal. Writing "in memory of the old German Navy," Admiral Hollweg recounts the deeds of German seamen during the war, and warmly praises their devotion to duty, but is critical of the high command which kept the main fleet inactive and thus prepared the ground for agitation which eventually undermined the discipline of the personnel. Commander Assmann gives an interesting account of the present-day organization and training of the fleet, and makes it clear that the long-service system is building up a nucleus of seamen with a much higher standard of proficiency than it was possible to reach when conscription was in force and service limited to three years. The active fleet now consists of four battleships, six light cruisers, twenty-four torpedo-boats, and various auxiliaries. On being reinforced by the battleships *Schlesien* and *Schleswig-Holstein*, which are not yet in commission, it will have reached the maximum strength permitted by the Peace Treaty. As a material reserve, for which the Inter-Allied Control Commission has sanctioned weapons and ammunition, there will be the battleships *Lothringen* and *Preussen*, the light cruisers *Niobe* and *Nymphe*, and eight torpedo craft. In the course of this year half the battleships, all the light cruisers, and all the torpedo-boats will have reached the limit of age prescribed in the Peace Treaty, and will thus become eligible for replacement. So far, however, only one *Ersatzbau* has been laid down—a light cruiser of the latest war model—and financial difficulties are expected to delay the replacement of the other obsolete units.

The development of Navies from 1918 to 1922 is the subject of a most informative essay by Commander Lütjens, who, besides giving a full, fair, and accurate review of international naval policies in the post-bellum period, has some useful comment to offer on the effects of the Washington Treaty. Apropos the four British battle cruisers of the super-*Hood* class which had been ordered previous to the Conference, he leaves it an open question whether this was "merely an Admiralty gesture which would enable England to go to Washington, like the other Powers, with a building program already in hand, or whether it was seriously intended to build the ships." In this writer's judgment, the outstanding result of the Conference was the demonstration of Anglo-Saxon unity in confronting the problems of the Pacific.

Another valuable article is that by Herr Ahnhudt, the distinguished naval constructor, on the future of the battleship. His conclusion that it will probably survive all the perils of aerial and submarine attack, and continue, though perhaps in some modified form, to be the prime agent of sea power, is quite in accord with the best naval opinion in Germany, where the anti-battleship doctrine has been decisively rejected. Dealing with the peril of gas attack at sea, Herr Ahnhudt writes: "Afloat as well as ashore, gas warfare must receive attention. Attempts have been made to charge bombs with poisonous gas, and so to envelop the target in a cloud of noxious vapor, which the artificial ventilation system of the ship would spread to every compartment. But in view of conditions at sea, where the air is almost always in movement and ships are able to travel at high speed, it is doubtful if the gas danger will ever become as serious as on land; besides which men on board ship have means of protection very different from those available to troops fighting ashore."

Naval students everywhere will welcome the reappearance of *Nauticus*. In the old days the book had a well-deserved reputation for technical and statistical accuracy, and as a reliable guide to current progress in the war and mercantile fleets of the world. Nor do the contents of the new issue show any falling off from this high standard of dependability. There is plenty of propaganda, of course, but of so obvious a character that it need not be confused with the more useful material in which the volume abounds.—Hector C. Bywater in *Naval and Military Record,* 20 June, 1923.

Germany From Within.—*To the Editor of The New York Times:* There seems to be just one thing on which the Germans stand solidly together, and that is a white heat of hate toward the French.

In every compartment of every train is a colored poster showing a Ruhr workman, his face slashed with sabre cuts and streaming with blood, but set in an expression of stern though suffering determination. Above are the words "Trotz Allem" and below "Wir bengen nicht" (We shall not yield). Then follows an appeal for funds for the suffering mine and factory workers of the Ruhr.

Everywhere in the streets, hotels and other public places this picture and others of similar character are displayed.

In the corridor of my hotel in Dresden was a card on which was chalked in red: "To all free men! Room No. 90." The little placard intrigued me. It savored of dire and secret plottings. but when I asked discreet questions I met with blank looks and the mystery of "No. 90" rests for me unsolved.

A thing that struck me in Berlin was the great number of Russians and Japanese one saw everywhere about. I was told that many of the Japanese were students at the Polytechnic and other schools. For the rest of them I could not account.

In a train I fell into a talk with a blond Fraulein, who, all unknowingly threw some light on the matter. She was of the gentle, unassertive type,

but intelligent and apparently sincere. It came out that she was engaged to be married to a Japanese scientist, a professor in a Berlin school.

I gradually steered the conversation to the state of public opinion regarding the possibility of another war. Her face became very grave.

"There is very much propaganda," she said. "The war films are always being shown, and they draw enormous crowds. The men are very enthusiastic. The 'Frederick the Great' picture has been running for more than a year—I think there will be a war—perhaps before ten years."

"But if you have no munitions and all your factories are held by the French, how then?" I asked.

She smiled gravely.

"Ah, but Krupp has many great factories in Russia and there they are making guns for Germany. Also in Japan they are building many warships for us. In the next war Germany will have for her allies Russia, Japan and Turkey."

Her quiet assurance was startling. I felt that I was listening to a phonographic recital of a conclave of an inner and informed circle.

"Do the German women want another war?" I asked.

"Mein Gott, nein," she said fervently.

"But the German women could prevent it," I said, "if they joined together, all of one mind against it."

"No, they would never do that," she said.

I have been told that the middle class in Germany has practically disappeared, having been fused into the proletariat. I begin to doubt that statement. If it is true, then it must be the proletariat that fills night after night to the uttermost corner every opera house, theater, music hall and restaurant in Berlin.

In Dresden, once the home of cheap and great opera, prices are now enormously high, costing 100,000 marks for a chair in a loge, and from that down to 50,000 marks. Seats at the Staats Theater were proportionately high, but in spite of this the two great houses were completely sold out every night that I was in Dresden, and so were the many other theaters. And the people who filled them were Germans, for at this time there are almost no tourists in Dresden, due, perhaps, to the infernal weather that has prevailed in Germany for the last seven weeks.

So, despite unheard-of prices for bread and meat and the other necessities of life, the German people can still afford to pay high prices for amusements.

Even for foreigners, prices in Berlin, Dresden, Baden and other popular places are extortionate. It is irritating to be discriminated against as an "auslander." I began to feel that it was a term of opprobrium when I saw an "inlander" march off with a parquet chair, paying 50,000 marks therefor, when I must pay 108,000 for the next seat.

The dollar continues to soar, and now the Germans are charging foreigners, especially Americans, huge prices in the hotels, making them pay in dollars; but even so, one lives here on half or a quarter of what one needs to keep alive on in New York. I am staying now at the most beautiful and also the most expensive hotel in Baden. A single room with bath and three good meals costs an American $6 a day; a room without bath, $4. But a German gets the latter for the equivalent of $1.45. In Wiesbaden, in a hotel of the Ritz type, where my room was the last word in luxury and the food epicurean, I paid a month ago about $1.25 a day, taxes, meals and everything but wine included.

Then the mark stood at 60,000 to the dollar. Now it is at 130,000. What is to be the end?

A French officer of whom I asked this question answered it with a shrug.

Millions of the German people are underfed. Many are on the borderland of starvation. Many have crossed the line. Milk, butter, sugar, meat and green vegetables are unknown on the tables of many once prosperous people, while for the poorer people bread and potatoes are the staple ration. And now bread is so high that in some hotels it is not furnished. Guests must buy it for themselves outside.

The Germans are a proud and a stubborn people, and now while the French heel grinds ever more and more heavily the undertone of the deep hymn of hate gathers in strength and volume day by day. If the Government today were to abandon "passive resistance" in the Ruhr I believe that the people themselves would continue the struggle voluntarily.

The feeling of martyrdom throughout the world's history has always given abnormal strength and endurance to the supporters of a cause. If the French insist on making the abandonment of "passive resistance" a sine qua non of a consideration of the German offers on reparations, the question will never be solved.

In the meantime Germany's industrial life is suffering a creeping paralysis, reaching ever nearer and nearer the heart. Central Europe is steadily sinking into chaos, and the forces of anarchy and Bolshevism are gaining by leaps and bounds. Baden Baden, June 22, 1923.—Sutherland Clarke in *New York Times,* 15 July, 1923.

JAPAN

Japanese Sea Power.—There has been so much discussion of late in the British and American Press on the subject of Japan's post-Washington naval program, which provides for a larger aggregate of new tonnage than any other Power has now in hand, that the following survey of Japanese construction policy—for which I am indebted to a very well-informed correspondent in Tokyo—is particularly timely and interesting. After pointing out that Japan has honorably fulfilled her obligations under the Treaty by abolishing all save two of the sixteen capital ships included in the original "eight-eight" scheme, my correspondent continues as follows:

"Since the Treaty did not affect small ships, Japan felt herself at liberty to carry out, in an abbreviated form, the original program of light tonnage, the more so as all the other Powers continued to build these smaller naval types, or had expressed their intention of doing so. What we are now doing, therefore, is to proceed with the building of such cruisers, torpedo craft, submarines and gunboats as the Ministry of Marine judged to be absolutely essential to the defense of the Empire. But so far from having added to the original light program, we have actually reduced it by 13,000 tons. Otherwise, it has only been modified to the extent of building certain units to increased dimensions—for example, some cruisers have been enlarged from 5,600 to 7,000 or 10,000 tons, and a few submarines at first intended to be medium boats have been re-designed on ocean-going principles—and curtailing by one year the completion date of all vessels, which means that the program will have matured by 1927 instead of 1928.

"It is often assumed that these light craft are peculiarly adapted to offensive operations and are being built with that object. But there is no real ground for this assumption. As regards cruisers, Japan has a large and thriving sea trade, which in case of war would need to be protected, and to this work the fast light cruiser is admirably suited. Other countries, notably the United States and England, possess many similar ships, but no one accuses them of meditating a raid on the shipping of another State. The destroyer is essentially a defensive type, especially in the hands of a power like Japan, which is so remote from any possible future enemy. These boats have a very limited steaming radius, which keeps them tied to their own coast or battle fleet, and they could not well be used for attacking commerce.

"This leaves only the submarine, regarding which Admiral G. A. Ballard, of the British Navy, wrote not long since: 'It is an open question whether the greater part of the money that Japan is spending on other ships would not be better invested in the form of submarines, for Japanese waters are particularly well suited to the operations of that type of vessel on account of their great depth, which precludes the possibility of submarines being mined in as they were in the North Sea. With a couple of hundred of these craft as a defense no foreign battle squadron would ever be likely to approach her coasts or attempt to enter the Yellow Sea.' This confirms the accuracy of Baron Kato's judgment when he insisted at Washington that cruisers and submarines should be rated as defensive ships.

"Finally, it should be borne in mind that Japan is totally dependent on sea communications for her very life. Without an adequate navy she could be easily subdued, either by blockade or direct attack. It was for this reason that she decided, after agreeing to scrap the best part of her battleship fleet, to build a moderate number of other types whose war value had been automatically increased by the disappearance of so many Dreadnaughts. Japan is building against no one, but simply and solely to cover the minimum requirements for defense; nor will her present program be enlarged unless some drastic change takes place in the scale of relative strength now existing."

Figures are appended to this statement, showing the present and future strength of the Japanese Navy in cruiser and smaller types, and for purposes of comparison I have tabulated these with the corresponding figures for Great Britain and the United States:

	Japan.	G. Britain.	U. S. A.
Light cruisers completed since 1918	12	11	1
Do. now building	7	5	9
Do. authorized, but not yet begun	6	0	0
Totals	25	16	10

To avoid misconception it should be remarked that all but one of the British ships were laid down during the war—the exception being the cruiser-mine-layer *Adventure*—while all ten American ships and twenty-three of the Japanese were begun subsequent to the Armistice.

As to Japanese destroyers, the letter states that "Only twenty-four boats are to be built between now and the year 1927. They will be slightly larger than the American flush-deck type. Including these boats, the Japanese Navy will have less than 100 modern destroyers, whereas the United States has 300 and England about 150." The statistics relative to submarine construction are less detailed, but they show that Japan during the last four or five years has been laying down boats at the average rate of six per annum, while at the close of last year twenty-four new boats, mainly of ocean-going type, remained to be built.

The following details of Japanese expenditure on defense for the current year are taken from the *Marine Rundschau.* Out of a total budget of 1,350,000,000 yen, about thirty-seven per cent is to be spent on armaments, as compared with forty-nine per cent in the preceding budget. This reduction in the bill for defense is due mainly to the Washington Treaty and the measures resulting therefrom. The Army Estimates of about 200 million are smaller by forty-seven million, more than twenty million yen having been saved by the retrocession of Tsingtao alone. The Navy Estimates have dropped from 394 million last year to 286 million this year, thus reducing the expenditure per head of population on this service from six and seven-tenths yen to four and seven-tenths. In the current

estimates about fifty million is taken for new construction and thirty-two million for developing naval aviation. The army flying service benefits to the extent of ten million. The cost of carrying out the Washington Treaty and the building program of 1923-28 (four 10,000-ton cruisers, four 7,000-ton cruisers, twenty-four destroyers, twenty-four submarines) is estimated at about 420 million yen, distributed as follows:

Year.	Construction of aircraft-carriers and scrapping of ships.	Building Program 1923-28.
1923	Yen 2,259,107	46,592,890
1924	4,698,288	70,000,000
1925	4,596,552	96,222,972
1926	6,768,195	85,000,000
1927	6,457,858	71,054,030
1928	8,000,000	——
1929	8,000,000	——
1930	9,220,000	——
Total	50,000,000	368,869,892

According to Japanese Press reports, the following naval construction was in progress or on order in the various yards at the end of 1922: At Yokosuka Dockyard: Battle cruiser *Amagi,* converting into an aircraft carrier of 24,000 tons; aircraft carrier *Hosho;* oil tanker *Naruto,* 14,500 tons. At Kure Dockyard: Conversion of *Akagi* into aircraft carrier, of 24,500 tons; oil tanker *Hayatomo,* 14,500 tons. At Saseho Dockyard: Light cruisers *Yubari,* 3,500 tons, and *Yura,* 5,500 tons. At Maizuru Dockyard: First-class destroyer *No. 5,* 1,400 tons. At Mitsubishi Yard, Nagasaki: Aircraft carriers *Chogei* and *Jingei,* of 8,500 tons each; light cruiser *Kawachi* (?), 5,500 tons; gunboat *Hodzu,* 340 tons; first-class destroyer *No. 1,* 1,400 tons. At Kawasaki Yard, Kobe: Light cruisers *Kiso* and *Jinstsu,* 5,500 tons each; second-class destroyer *No. 4,* 850 tons; oil tankers *Into* and *Mamiva,* 14,500 tons each. At Mitsubishi Yard, Kobe: Gunboat, *Ira,* 340 tons. At Uraga Dock Co: Light cruisers *Isudzu* and *Abukuma,* 5,500 tons each; second-class destroyers *No. 6* and *8,* 850 tons each. At Osaka Ironworks: Oil tanker *Sekiro,* 14,500 tons; mine sweeper *No. 3,* 700 tons. At Kobe Steelworks: Gunboat *Katada,* 340 tons; mine sweeper *N. 1,* 750 tons. At Harima Yard: Gunboat *Seta,* 340 tons. At Yokohama Dock Co.: Light cruiser *Naka,* 5,500 tons. At Ishikawajima Yard: Second-class destroyers *Sumire, No. 10* and *No. 12,* each 850 tons. At Fujinagata Yard, Osaka: second-class destroyers *Nos. 16* and *18,* 850 tons each. At Tama Works: Minesweeper *No. 2,* 700 tons. It is further reported that fifteen submarines were in hand at the end of the year, including three first-class boats, *No. 58* (Yokosuka), *No. 57* (Mitubishi, Kobe), and *No. 51* (Kure). The keels of two new cruisers, *Kinugasa* and *Furutori,* of 7,500 tons each were laid recently, the first at Yokosuka and the second at Kure.—Hector C. Bywater in *Naval and Military Record,* 6 June, 1923.

Must Have France in.—Washington, July 5.—Japan's suggestion for a three-Power armament agreement with Great Britain and the United States, as a substitute for the five-Power treaty signed at the Washington Conference and still awaiting ratification by France, has met with small favor in high naval circles here. Such a pact would defeat its own purpose, according to the opinion of some naval experts, and in order to be of even moral value, it would have to involve at least a tacit offensive and defensive alliance, viewed as improbable of congressional approval.

Elimination of France from the subscribing powers, it was pointed out, might be accepted as giving that country an unanswerable argument for embarking upon a comprehensive naval construction program embracing the types which she has already officially sponsored—the cruiser and submarine. Entailing comparatively small cost and a short construction period, France is seen here as possessing both the facilities and financial ability to embarrass at least one of the other Powers by any extensive development along these lines.

In view of this situation, the American naval authorities who helped frame the Five-Power Washington treaty are expected to advise against any reduction of the agreement to a three-Power basis.—*Boston Transcript,* 5 July, 1923.

Japan's New Naval Chief.—It is reported from Tokyo that the Prime Minister, Admiral Baron Kato, has resigned the office of Naval Minister, which he had held concurrently with the Premiership. Admiral Kato has been in control of Japanese naval policy for the past seven years. He was the author of the "eight-eight" program introduced in 1920, which but for the intervention of the Washington Treaty would have made Japan the second strongest naval Power in the world. This measure legislated for the construction of no fewer than sixteen capital ships of post-Jutland design, or exactly the same number as were to be built under the United States program. When the Washington Conference met it became the duty of Admiral Kato, as chief Japanese delegate, to scrap the "eight-eight" scheme and accept a ratio of battleship strength which at first sight condemned Japan to permanent inferiority as compared with this country and the United States. Since then, however, she has embarked on a considerable program of minor construction, and will eventually have a fleet of cruisers and submarines second to none.

It was due to his diplomatic success at Washington that Admiral Kato was appointed Prime Minister last year. He has now handed over the Navy portfolio to Admiral Hyo Takarabe, at present commanding the Sasebo naval station. The new Naval Minister was born in 1867, graduated from the Naval College in 1890, and served as a staff officer in the Chinese and Russian campaigns of 1894 and 1904. He was Vice-Minister of the Navy in 1913-14, but took command of the Third Fleet in 1915 and operated against German interests in the Pacific. There is no reason to suppose that the change of Ministers will have any effect on Japanese naval policy.—*Naval and Military Record,* 6 June, 1923.

UNITED STATES

New Ships Completed.—Of the new vessels under construction, the following are the dates on which completion of work is expected: viz.:

Colorado, September 1.	*Cincinnati,* September 1.	*Concord,* September 1.
West Virginia, October 12.	*Raleigh,* September 1.	*Medusa,* October 1.
	Richmond, June 30.	*Holland,* indefinite.
Milwaukee, July 1.	*Detroit,* July 1.	

—*Our Navy,* 1 July, 1923.

The Navy Building Program.—Of the vital need of additional cruisers, additional light draft gunboats, additional submarines and additional airplanes for the American Navy Secretary Denby has had the good sense several times recently to speak. What he says now, however, will be of little worth save insofar as his statements commit the Administration for the future. Our building program, to be well balanced and to conform to the letter and to the spirit of the treaties of Washington, must include

the modest additions in auxiliary craft to which Mr. Denby is inviting attention.

The Navy League of the United States has compiled, and recently published, some interesting data on the comparative strength of the Navies of the United States, the British empire and Japan. The figures on cruisers and submarines are well worth reproducing here. (It will be remembered by our readers that neither light cruisers nor submarines are limited by the Washington Conference treaties.) In light cruisers the British empire has forty-four built, Japan has ten built, and the United States has one. Of cruisers building, we have nine, the British have four, while Japan has fifteen. So that built and building, we have a total of ten ships of 75,000 tons, the British have forty-eight ships of 252,990 tons, and Japan has twenty-five ships of 157,730 tons. Now, turning to the 5-5-3 ratio, we see that Japan is the pacemaker, and that the increment necessary for us to obtain our "5" to her "3" is equal to nineteen cruisers aggregating 187,883 tons. Measured in the same way, Great Britain needs one more cruiser of 9,893 tons. The submarine figures are equally impressive. Of large, seagoing, long radius submarines Great Britain has fifteen; the United States, three, and Japan, none built; but Japan has twenty-eight building, the British are building two and the United States has three under construction. Again we find Japan setting the pace, and the British empire and the United States lagging, so that for the attainment of the 5-5-3 ratio the British must build twenty-nine more submarines and the United States must build forty more.

In submitting the naval appropriation bill for the fiscal year which begins July 1, the House Committee listed in its report fifty-six vessels then building for the Navy. The report stated that there was needed to complete these vessels $88,831,000, and that the committee proposed to appropriate $55,000,000 which was done by the Congress. On July 1, 1924, there will probably be two airplane carriers, three light cruisers, two destroyer tenders, one submarine tender and nine submarines of this program still under construction, and if there is no change in the above mentioned estimate there will be an appropriation of $33,831,000 necessary to complete these vessels. And, by simple arithmetic, that will leave a balance of $21,000,000 for other new construction, provided there is no increase over the amount appropriated for that item in the last bill.

Here, then, is where we must face a practical proposition! The 5-5-3 ratio must be made an actuality, and to do so we need nineteen more light cruisers and forty more seagoing submarines. In order to provide them it will be necessary to make a slight increase in the naval appropriation bill, but Secretary Denby must recommend that the ships be built, and must see to it that the country understands the necessity for our building them. By all means he should recommend to Congress that construction be started immediately on at least twelve light cruisers and not less than twelve seagoing submarines. Otherwise the United States will be guilty of violating the spirit of Washington treaties, shirking the responsibilities they impose and betraying the nations that assumed America's good faith in calling the conference at which the treaties were negotiated.—*Boston Transcript*, 25 June, 1923.

Defenses of the Panama Canal.—The increasing use being made of the Panama Canal, as detailed by Governor Jay J. Morrow in his statement of yesterday, brings forcibly to mind the need of more adequate defenses for this great waterway. It is recalled that Governor Morrow advocated improving the fortifications of the Canal Zone in his last annual report and that similar recommendations were made by Secretary Denby and Secretary Weeks following their tours of inspection this year. The peace-time, commercial use of the waterway is not to be deprecated, but

its greatest value to the country is the use which would be made of it in time of war.

It is heartening to know that traffic through the canal has doubled in the last year and that the revenue from tolls received during the current year will approximate $24,000,000, but it is disquieting to be solemnly advised not alone by the civilian heads of the land and sea establishments but by the ranking commissioned officers of the Army and Navy that the means of defense are such that in event of hostilities, an enemy fleet, lying beyond reach of our land batteries, could put the canal out of operation.

Hardly a modern gun is to be found at either the Atlantic or Pacific entrances to the waterway. Due to the parsimony of Congress, inadequate land, sea and air forces are stationed in the Zone. Experts are unanimous in saying that sixteen-inch guns should be installed, preferably on Taboga Island, now owned by the republic of Panama; that larger air and land forces should be maintained in Panama; and, with the increased use of the airplane, that concrete shelters be erected over the locks and the other vital parts of the waterway.

That the executive branch of the Government appreciates conditions in the Canal Zone is evidenced by the statements of Secretaries Weeks and Denby, and, as well, by the negotiations between the Department of State and Republic of Panama for a new treaty, under which this Government will purchase Taboga Island, or reach an understanding whereby it may place fortifications on the island. It is to be hoped that a similar interest will be taken by the Sixty-eighth Congress next December, when it will receive recommendations for adequate appropriations from the heads of the two departments and conceivably from President Harding.—*Boston Transcript,* 12 July, 1923.

Hughes Sees French Action as End of Naval Troubles.—All talk of the substitution of a three-Power treaty embracing the United States, Great Britain and Japan, to replace the five-Power naval limitation pact of the Washington Conference, was definitely silenced tonight with the news that the French Chamber of Deputies by an overwhelming vote had ratified the five-Power agreement with "slight reservations."

The action was interpreted here as tantamount to subsequent approval by the French Senate, and a speedy exchange of ratifications by the signatory Powers—the United States, Great Britain, Japan, France and Italy. Only France had failed to ratify the naval treaty, and exchanges among the other nations involved has been made in several instances, so that the scrapping program, delayed in the United States, Great Britain and Japan because of the failure of France to act, can be put into operation probably within a short time.

Secretary Hughes, who throughout the long period of French delay and in the face of Japanese agitation for a three-power substitute, has remained firm in the belief that France eventually would come through, received the news with undisguised gratification at this definite sign that the big effort of his administration in the State Department was about to be crowned with success.

Mr. Hughes, as none other in Washington perhaps realized the difficulties at home and abroad which would confront any attempt to frame a new treaty of the three big naval powers.

Officially, at least, he has given no encouragement to the Japanese proposal, as he was confident France would ratify. Not later than Thursday M. Hanihara, the Japanese Ambassador, discussed the situation with Secretary Hughes, but it was apparent little headway was made toward the three-power plan.

In navy circles, where the limitations treaty naturally has not been popular, there was little comment, although Secretary Denby and his aides view the action as alleviating the predicament in which the Navy has found itself since the treaty was signed. Once the agreement is put into effect the Department can proceed definitely with its plan of keeping the American fleet up to the full 5-5-3 ratio. The uncertainties of the last year which have embarrassed the Administration and the Navy's dealings with Congress virtually are wiped out by the action of France.

For example, the recommendations of the Navy General Board that the United States, during the current fiscal year, keep a minimum force at sea of eighteen battleships, fourteen cruisers and eighty-four submarines has been approved by Secretary Denby. The eighteen capital ships amount to the so-called Treaty Navy, as far as the United States is concerned, but the question of increasing the gun elevation of older capital ships, the scrapping of the building program, which was halted with the signing of the treaty, and problems of navy personnel would have remained in a state of confusion had the French continued to delay action or the Government decided to effect a new treaty with Great Britain and France.

The sensation of relief experienced in Washington also arises from the political phases of the situation. President Harding regards the results of the Washington Armaments Conference as the important accomplishments of the first year of his administration, and the naval treaty always has been the popular high light of the conference agreements. To tackle the Senate with a proposal for a substitute treaty in a year before a presidential election presents an experiment that the practical men in Washington officialdom do not care to undertake.

The Five-Power Naval Treaty, as signed February 6, 1922, provides that the United States shall retain eighteen capital ships of a tonnage of 500,650 tons; Great Britain, twenty-two ships of a tonnage of 580,650 tons; Japan, ten capital ships of a tonnage of 301,320 tons; France, ten capital ships of 221,170 tons, and Italy, ten capital ships of 182,329 tons.

On completion of the *West Virginia* and the *Colorado*, post-Jutland dreadnaughts now nearly ready at Newport News, Va., and Camden, N. J., respectively, the United States is to scrap the *North Dakota* and *Delaware* and retain eighteen ships with a total tonnage of 525,850 tons. Two new ships of 35,000 tons each are allowed the British, but upon their construction Great Britain will scrap the *Thunderer, King George V, Ajax* and *Centurion* and will retain twenty ships of 558,950 tons.

Generally the treaty provides for no replacement beyond that specified above for a ten-year period although France and Italy are permitted to lay down new capital ship tonnage in 1927, 1929 and 1931. The treaty provides the maximum replacement limits as follows:

United States, 525,000 tons; Great Britain, 525,000 tons; Japan, 315,000 tons; France, 175,000 tons; Italy, 175,000 tons.

Aircraft carriers are limited by the treaty to 135,000 tons each for the United States and Great Britain, 81,000 tons for Japan and 60,000 each for France and Italy. No limit is placed in the treaty on the number of cruisers, auxiliary craft or submarines, but resolutions were adopted against the use of submarines against non-combatant ships. With respect to cruisers and auxiliary craft the treaty provides that no vessel shall exceed 10,000 tons or carry guns of a caliber in excess of eight inches. Aircraft carriers are limited in size to 27,000 tons except in that each may build two of a tonnage not to exceed 33,000 tons.

U. S. Will Maintain Navy at Full Treaty Strength.—The United States will maintain at full efficiency during the next fiscal year "a minimum naval force at sea" of eighteen first-line battleships, fourteen cruisers and eighty-four submarines under a decision by the General

Board, formally approved by Secretary Denby.—*Philadelphia Public Ledger,* 8 July, 1923.

Singapore.—British Plan to Develop It as Great Naval Base Not Considered in Washington Any Violation of Spirit of Naval Pacts.—Washington, July 13.—Americans will not feel apprehensive over the decision of the British Government, confirmed by the vote of Parliament, to fortify Singapore. On the contrary, this decision may be regarded here as quite in line with a British policy which certainly does not account the United States as a potential enemy and may have its source quite as much in the promptings of certain of the British colonies, notably Australia and New Zealand, as in any thought which looks to friction with the United States.

Under the Washington agreement the fortification of mandated territory and of certain British islands was prohibited. It was probably at British instigation and with the future fortification of Singapore in mind that the conference created a prohibited area east of longitude 110. If this was not the understanding during the Washington conference, at least Americans will not be greatly surprised by the statement of the Marquis of Salisbury in the House of Lords a day or two ago that the base at Singapore was prominently in the minds of the British negotiators.

Australia and New Zealand, it will be recalled, were considerably exercised over the proposed abrogation of the Anglo-Japanese alliance and the decision of Great Britain to fortify Singapore may meet with special approval in those colonies. The distant menace is Japan, who measures her plans by the centuries rather than the exigencies of the present, and who ever is ready to put to sleep with treaties or agreements the suspicions or fears of her great world rivals.

Singapore, lying in the Straits of Malacca, is the gateway to the Far East and a point of immense strategic importance to any Power contemplating operations from a base far from home. South lie the Dutch East Indies and here Japan is carrying to the utmost limits her policy of peaceful penetration. She is buying land extensively and it is even said that

Dutch officials are prohibited from entering upon the territory thus acquired. The Dutch are a weak nation, depending upon the greater Powers to protect her interests and it is believed that the Dutch Government also will view with approval the decision of the British Government to fortify Singapore. Indeed, the Dutch contemplated constructing fortifications upon one of the East Indies and establishing a submarine base near Singapore. The proposal came up in the Dutch Parliament and the Government, in the matter of votes, probably was strong enough to put it

through, but it did not do so, possibly in consideration of the strong Socialist movement which has developed in Holland, as in many other countries, since the World War. Neither the British nor the Dutch Government even remotely contemplates conflict with each other, consequently and in view of the political situation in Holland, it may be with relief that the Dutch officials learned that Great Britain contemplates the fortification of Singapore.

Neither is it to be regarded as conceivable that the United States and Great Britain can come into military conflict in the East. In a possible clash between the United States and Japan, England might not take sides with this country, but most assuredly she would play the part of a benevolent neutral, as would Holland. Almost certainly England could not fight the United States without losing Canada, which although not aligning herself with America against the mother country, at least might be expected to assert her own independence and set herself up as a neutral. For these and many other reasons war between the United States and Great Britain is regarded as an impossibility, not primarily for sentimental reasons, although these might cut some figure, but because such a conflict would mark the beginning of the disruption of the British Empire.

The suggestion of Viscount Grey that the naval base at Singapore is not an essential expenditure, and that Australia and New Zealand might be better protected through local bases, will not find a very hearty echo in this country, where, as already intimated, it is the impression that colonial influences have played their part in determining the British Government to establish this base on its own resources. It will be recalled that after the war Lord Jellicoe was sent on a tour throughout the colonies in the interest of a scheme of imperial defense, and that the colonies, exhausted by the conflict which had cost them so much of men and money, were found cold to the project, and it failed. But an imperial conference is to be held in London in October, and while it was argued during the parliamentary debates that the proposed naval base at Singapore might well await the deliberations of that conference, it is significant that these arguments did not withhold the Government from putting through its plans, which the colonies presumably will approve in the forthcoming imperial conference.

Great Britain already has a drydock at Singapore which will accommodate any ship in the British Navy in point of length but is too narrow for some because of the "blisters" which Great Britain has attached to some of her larger vessels to give them more beam. But England already possesses two floating docks, and soon will finish a third, which are designed to accommodate any two ships in the British Navy. It is the belief that one of these docks will be towed to Singapore, where it can be established with such surroundings of mine fields, artillery, etc., as to be made unassailable. Indeed, it is believed that the proposed Singapore base will be found invulnerable, even to attack by aircraft. Apparently it is not the opinion here that the establishment of this naval base violates the Washington agreement in letter or in spirit, but rather that it is a project to safeguard peace in the Far East and to quiet the apprehension of some of the British Dominions without implying hostility to any other Power, unless a far-sighted preparation for possibilities involving Japan.—*Boston Transcript,* 13 July, 1923.

MERCHANT MARINE

Mr. Lasker's Final Recommendations for Shipping Board Fleet.—Chairman Lasker handed to President Harding his formal resignation from the Shipping Board with a letter stating what he had accomplished and what he recommended for his successor, Edward P. Farley.

He prefaced his recommendation by declaring that the effort to sell the Government fleet to private owners was apparently a failure. "Developments thus far indicate that . . . . most of the bids will be inadequate, and in the main the Government will be forced to maintain in some way the routes now being operated at its expense."

He then recommended:

1) That from twelve to eighteen subsidiary corporations be created under the Emergency Fleet Corporation, each to operate a route and control the good-will and terminal facilities, assets of increasing value to the Government.

2) That 250 ships be allocated to these corporations, replacing 400 ships now operated in these services.

3) That of the 1,200 ships remaining, the unprofitable ones be scrapped.

4) That 200 of the remainder be set aside as a reserve and that a "given number" of these be equipped with Diesel engines instead of oil-burning equipment. This would improve their efficiency by twenty-five per cent and make it possible soon to repay money borrowed from the Shipping Board's construction loan fund.

5) That the remainder of the ships be sold to any buyers foreign or American "at the best prices obtainable."

6) That thereupon all surplus tonnage still remaining be scrapped because they act as a "depressant upon the merchant marine of the world, and, most of all, upon our own."—*Time,* 18 June, 1923.

Marine Body Opposes Government Policy.—Almost complete disagreement with the shipping policies now being considered by the Government was expressed in a statement issued today by the National Merchant Marine Association. The association, of which Senator Joseph E. Ransdell, of Louisiana, is president, is opposed to Government operation; wants the coastwise laws extended to the Philippines; desires profitable rail rates on goods carried in American vessels; urges abrogation of the commercial treaties which prevent preferential duties on goods imported in American vessels; demands revision of the La Follette Seaman's Law; approves legislation to make mandatory legislation restricting to American vessels fifty per cent of the immigration into this country, and favors use of private shipping for the carriage of army troops and supplies.

These opinions, the association said, were obtained as a result of a questionnaire sent out to all of its members.

"If the Government is determined to utilize direct operation at all," said the association statement, "it should be carried on only until legislative aid can be obtained that will enable American vessels to compete in our own trade with the cheaper built and cheaper operated tonnage of our foreign competitors.

"It is felt that every possibility for the disposal of the trade routes to Americans should be exhausted by the board. A very liberal policy in regard to prices and terms would be justified if the ships could be turned over to private enterprise and operated in the interests of the expansion of American commerce, with an efficiency that Government representatives themselves admit cannot be attained under direct Government operation.

"If direct Government operation should result, as seems inevitable in the elimination of the private operators under whose work the new trade routes have been built up, a potent factor in the development of American shipping will be lost."—*Philadelphia Public Ledger,* 18 June, 1923.

America Will Fight for Place on the High Seas.—We are passing through a momentous period for the future of Mr. American Merchant Marine. The industry is somewhat "groggy" from what looked to be a knockout blow, when Congress failed to do anything constructive for our

champion, and left us groping around in a dazed condition to get up steam and energy enough to make a further attack on our old opponent, Mr. Aggressive Foreign Shipping. We are gradually wiping the blood out of our eyes, getting back our breath, and sparring around the ring for another opening.

Things look rather squally at the present writing and unfriendly "bookmakers" (editors of foreign shipping papers) are offering odds against our ultimate success in this prize ring of shipping on the seas. Our Uncle Samuel, while unwilling apparently to give us any life-inspiring oxygen treatment, is delivering to us the ultimatum that, if we do not resume the battle on our own strength alone, he will step in the ring himself for a round or two, and show us how to battle.

Of course, Uncle Sam has a couple of brass knuckles on his fists, in the shape of a strong Treasury behind him, but such, while it lasts, is not teaching us the game of fighting. Besides that, the spectators who put up the coin for Uncle to battle with are a fickle bunch, like all other gatherings at sporting events, and at a critical time are liable to yell "Take him out," if he wabbles a bit in the encounter.

Naturally, rather than to see the fight called off entirely, we are willing to see Uncle do the fighting himself, at least until our breath is fully recovered, and we can take off a little more of the extra weight we have been carrying, and be able to get back in the ring ourselves for another try for the championship. As the gate receipts for events of this kind are very lean just at present, we had better bestir ourselves to getting in better condition, while Uncle keeps our opponents busy with his brass knuckles.

No, we are not discouraged, and we haven't lost sight of the prize for which we are battling. This extra weight we are carrying can and will be worked off before we again tackle our enemies. When Uncle lets us take our place in the ring again, we would like a few cheers from the ringside, as nothing helps so much in a fight of this kind as to know that your own gang is with you.

Our seconds and trainers have outlined very good methods of training to reduce our surplus weight, and to harden up our muscles. The training process prescribed is now going merrily along on all sides. Already plans are in process for unloading the greatest part of our excess weight, in the shape of the great fleet of idle ships that stand as a menace to the real competition we are about to enter. Uncle has charge of this part of our weight reduction, and, if rumors be true, a very considerable portion of the laid up fleet is to be "scrapped" or "canned" whichever way may seem best to accomplish the ultimate purpose.

Such of the fleet which represent good fighting muscles are to be retained and put on the firing line, backed for the time being by Uncle. Others whose muscles are somewhat flabby, due to bad digestive apparatus in the shape of inefficient machinery, will have this defect remedied by the installation of Diesel engines, which will make of them real hardened muscular constituents of the fighting body of our merchant marine.

The overweight of inefficiency in operation in existing ships now being used on the firing line is being reduced on all sides. The Shipping Board's fuel economy efforts are getting more and more in evidence. The training of men in the proper and efficient use of fuel oil is showing better results all along the line, as the number of graduates of the League Island School are being distributed throughout the merchant marine. These graduates not only show better results, as the direct effect of their intensive training, on the ships which they operate, but they are rapidly disseminating the knowledge which they have received to others with whom they are associated who have not received the benefits of the special training. This whole effort will harden up a most important muscle in our fighting body on the competitive seas.

The cost of repairs has heretofore been a decidedly flabby muscle and a cause of much "overweight" in our fighting abilities. Very cheerful results are now being obtained from the increased skill and fighting spirit of the men who have this particular branch of the training activities in hand. Fighting spirit appeals to the average American, and this is being inculcated in our sea-going scrappers to a splendid degree, as each engineer has it impressed upon him that he must do his individual part in reducing repair costs, if our fighting merchant marine is to have a chance in the great international prize fight on the sea.

Inventors are rushing to the aid of our fighter, in the shape of improving the muscles in use by bringing out new ideas, for economizing in fuel consumption. Feed water heaters, superheaters, evaporators and economizers are receiving the most intensive study from the men who know most about these essentials to the economical use of fuel, and the reduction of repair costs.

In training a fighter of the type we want our merchant marine to be, it is not always best to take too much consideration of the first cost of essentials of this kind, as it is results we are after. High cost apparatus which greatly reduces the daily cost of operation is ofttimes a very cheap investment to make. In training a human fighter for a contest involving tremendous stakes, as modern fistic encounters do, just note how little heed is paid to the first cost of such essentials as the best quality of food or training apparatus to put the scrapper in shape for the great event. Results alone count when you are out to accomplish a definite object, whether in fistic encounters or in its parallel contest for a right to conduct a good part of our own commerce on the seas.

As this is to be a "gruelling" contest, as sport writers usually say, the preparation of our champion must be thorough and begin with the elementary essentials.

The American Marine Standards Committee suggested by Uncle, through his Department of Commerce, is now launched and ready to begin its part of the training process.—"Old Scotch" in *Marine Engineering and Shipping Age,* July, 1923.

"LEVIATHAN" BREAKS WORLD'S SPEED RECORD.—In a remarkable four and a half days' trial trip ending on Sunday last, the Shipping Board's giant steamship *Leviathan* won new laurels for the American merchant marine, by breaking all previous merchant ship records for sustained speed for a six and twenty-five hour period. The great vessel left Boston at 3:20 P. M. on Tuesday, June 19, rounded Cape Cod and then set a course directly south of Abaco Island in the Bahama group, a run of 1,123 nautical miles, which was made at a gradually increasing speed.

Abaco was rounded about midnight Thursday, and the ship was then headed for Jupiter Light, Fla., from which the course was set for Ambrose Lightship. The results of the vessel's speed runs from there on were summarized by W. F. Gibbs, who had charge of the liner's reconditioning, as follows:

"Jupiter Light House abeam 7:17 A. M., June 22. Then followed the regular northbound steamship track to Diamond Shoal Lightship, arriving 3:39 A. M., June 23. Distance 570 miles. Ship making an average speed of 27.99 knots.

"From Jupiter Light House to lat. 36.52 N., long. 74.21 W., a distance of 687 miles was made in twenty-five hours, making an average speed of 27.48 knots.

"During the first hour of the run from Jupiter Light, the average speed of the vessel was 28.04 knots, and for a six-hour period the average speed of the vessel was 28 knots."

"LEVIATHAN," QUEEN OF THE SEAS

In covering a distance of 687 miles in a space of twenty-five hours, the *Leviathan* surpassed the *Mauretania's* record westward day run of 676 miles made at an average speed of 27.40 knots on January 25-26, 1911, when the latter vessel had a strong gale of wind behind her, blowing at the rate of 71 knots. While the *Leviathan* was favored by ideal weather conditions, any advantage enjoyed by the boat as a consequence of running with the Gulf Stream was in Mr. Gibb's opinion more than offset by seawater of 84 degrees temperature having to be fed into her condensers which cut down the efficiency of her engines by an important percentage. Further, he pointed out, ships that have made records in the past have only approached the work of making new time marks after much patient preparation and "tuning in" of their engines, while the *Leviathan* went over the fastest course yet as one of the details of her tryout.

The *Leviathan* is now much faster and more highly powered than when she was under German ownership and operation. On her original trial run in the North Sea in April, 1914, her propellers developed 171 revolutions a minute and she ran at 25.84 knots for a short period. The new figures are 184 revolutions and 28.04 knots for four hours. The ship was designed for 65,000 horsepower and developed 90,000 on the trip, as the result of her conversion to oil burning and the installation of new condensers. When the vessel was a coal burner 436 men were employed in the fire-room, but now with oil burners, the number has been reduced to 267.

On her arrival in New York the 453 guests on board of the *Leviathan* expressed their admiration of the liner's equipment and personnel.

"Commendation is due the Messrs. Gibbs, architects and designers, and the Newport News Shipbuilding & Dry Dock Company for the splendid manner in which their contracts have been performed."

"The trial of the *Leviathan* was necessary and proved highly satisfactory," said Frank C. Munson, president of the Munson Line. "It takes several voyages to get the greatest efficiency, especially in the steward's department, and we can expect the *Leviathan* to equal the best."

"The trial trip demonstrated beyond dispute that brains, vision and perseverance plus pride are bound to win out," said Charles H. Potter, president of the United States Ship Operators' Association, "and to those who fought for years for a merchant marine it is a source of great encouragement."—*The Nautical Gazette,* 30 June, 1923.

"'LEVIATHAN' DINNER" SPEECHES ACCLAIMED.—London, July 18.—Influential Britons and Americans who are especially keen on improving the already good relations between the British and American peoples have spent much time since the pilgrim *"Leviathan* dinner" acclaiming the speeches made on that occasion, particularly that of Albert D. Lasker, former chairman of the United States Shipping Board.

All the British speakers, including Sir Philip Lloyd-Graeme, president of the Board of Trade; Worthington Evans and Lord Desborough, chairman of the Pilgrims, extended their welcome to the American visitors in terms of greatest cordiality and reaffirmed their well-known conviction that British and American co-operation and world prosperity and peace are synonymous expressions.

Justice Sutherland, Senator Smoot and Representative Longworth spoke eloquently of the harmony and spirit of the meeting, and Mr. Lasker made an address that was really illuminating to his British audience. His object was twofold; first, to state clearly the object of the United States in having a merchant marine, and second, to disavow any aim to injure the mercantile interests of any other country.

Many Voiced Appreciation

In the opinion of all who heard the speech both these objects were accomplished. Many voiced their appreciation of the dignity, purity and clearness of Mr. Lasker's diction, his firm grasp of the subject and the admirable temper of all he said. He made it plain that the farmers, manufacturers and traders of the United States could not depend upon foreign ships for the carriage of their commodities, citing by way of illustration that during the South African war cargo vessels were withdrawn from American waters to the great injury of American producers.

"Our people are resolved to avoid similar misfortunes in the future if they can," asserted Mr. Lasker. "Our wish is that your merchant marine and ours may prosper and we see no reason why they should not. Trade is expanding. There is a growing call for ships. Ships mean communication, communication means understanding and understanding means peace.

Tells of Great War Fleet Built

"We Americans find ourselves where we are respecting shipping as a result of the World War. Your Prime Minister called for 'ships, more ships and still more ships.' They were necessary, he said, to the salvation of freedom. We built them. They are now left on our hands as a gigantic investment. We must make the best use of them that we can. We challenge nobody and we attempt nothing but to safeguard our own welfare, and we do it all in the most friendly spirit. Our hope is that you will welcome to your shores our *Leviathan* and any sister ships we may send as we have welcomed and intend to go on welcoming your *Majestic* and the ships associated with her under your flag."

Various representative Englishmen declared that informative statements of this kind were all that were necessary to spread British and American friendship.—*Baltimore Sun,* 18 July, 1923.

First U. S. Diesel Electric Freighter.—The attention of many shipping men has been centered, and naturally so, on the performance of America's first large sized general cargo carrier equipped with the Diesel-electric method of propulsion—the motorship *Fordonian.* She was built in 1912 by the Clyde Shipbuilding Company, Ltd., Port Glasgow, Scotland, to conform to Lloyd's highest classification for the Canadian Inter Lake Line, Ltd., of Toronto, for carrying package freight to St. Lawrence River and Great Lakes ports, and is 250 feet long with a beam of forty-two feet six inches and a draft (loaded) of nineteen feet 1 inch. Her deadweight tonnage is 3800 tons and she was originally equipped with one 750 b.h.p. four-cylinder, two-cycle, 120 r.p.m. Diesel engine. All of the auxiliaries were steam driven, making it necessary to carry steam on the donkey boiler at all times.

This vessel was originally placed in service on the Great Lakes, but owing to her unreliable maneuvering qualities and the numerous number of locks through which she had to pass it was decided to operate her in the coastwise trade, where she experienced more or less trouble with her main engine. Her best speed was 6 knots with a fuel consumption of seven tons per day.

In 1920 the owners decided to remove the main engine and install a more reliable and profitable means of propulsion. Several different type. were studied, including steam, Diesel-direct and Diesel-electric.

The steam installation decreased the cargo space twelve feet, and Diesel-direct drive decreased the cargo space eight feet. The Diesel-electric, using the Ward Leonard type of control and direct-connected exciters, decreased the cargo space four feet, whereas the Diesel-electric, using the rheostatic type of control, allowed the cargo space to remain unchanged. The owners decided on the last-named system and gave an

order for two 500 b.h.p. 200 r.p.m. Ansaldo San Giorgio Diesel engines and General Electric Company's electric propelling and control equipment, which was installed at the Tebo plant of the Todd Shipyard Corporation.

Shortly after her sea trial in the latter part of January, 1922, the *Fordonian* proceeded to Cuba in ballast, and during this trip, with the exception of the last two days, ran into gales and heavy seas. The fuel consumption during this run was 0.46 pound per shaft s.h.p. hour for all purposes, excluding the steam-operated steering gear. During the fall of 1922 the *Fordonian* was operated under charter on the Great Lakes and St. Lawrence River. In this period she made an admirable record, carrying grain eastward and paper westward, right up to the close of the season. No trouble was experienced with either the engines or electrical equipment.

A total mileage of 6,645 was made before the ship became frozen in at Quebec due to a severe and unexpected cold wave. The fuel consumption over the distance averaged 0.44 pound per h.p. hour delivered to the propeller shaft, and this included not only the electrical trans-whatever electrically driven pumps were running, all of which was taken from the main generators when the ship was under way.

These figures on fuel consumption were based on careful tank soundings and readings of the electrical switchboard meters, which latter indicated accurately the actual horsepower developed. In the case of ships not equipped with electric drive, claims of certain rates of fuel consumption per horsepower are sometimes made on the basis of the power required to drive the ship at a given speed and draft, as taken from tank model test curves. Obviously many uncertainties are embodied in this method of calculation. Conditions of wind, tide and ship's draft all affect the power to make the given speed, and owing to the cube law of the relation between speed and power a slight error in estimating the speed will affect the results out of all proportion to the error. Last of all, the hull may not be built in accordance with the model; for example, it may be twin-screw instead of single, so that the tank test curves may not apply to the ship as built. In brief, electric drive permits most convenient and accurate measurements of actual power to drive a ship, regardless of conditions, imperfect lines, etc.

The over-all fuel consumption figures of the *Fordonian* are of particular interest, as the fuel for the main engines was measured separately from that used for the donkey boiler so that accurate data were obtained on the fuel used for the steam steering gear, deck winches and heating. The results show that with the ship under way the fuel burned in the boiler for the steering gear and for heating was forty-three per cent of that used by the main engines. For the entire four months of operation, both under way and in port, the fuel burned in the boiler for steering gear, deck winches, anchor windlass and heating was 105 per cent of the fuel burned by the main engines for driving the ship.

These figures are very valuable in demonstrating to both motorship and steamship owners the high cost of operating steam auxiliaries, and conversely the large saving to be obtained by the use of electric steering and deck winch equipment.

The *Fordonian* is now operating in the Great Lakes from Fort William to Buffalo in the grain trade. At the close of this season all steam equipment will be removed and electrical equipment installed.—J. E. Marwitz, *Marine Superintendent, American-Mediterranean Steamship Company, The Nautical Gazette,* 23 June, 1923.

Pacific Mail's New Motorships.—An order for two motorships has been placed with the Swedish shipbuilders Gotaverken at Gothenburg by the Pacific Mail Steamship Company. The first ship is to be delivered in June and the second in August, 1924. They are to be built as sister

ships, each of 3,000 tons deadweight, with a length of 300 feet, width of forty-five feet seven inches, molded depth to main deck of thirty feet. The vessels are intended for the Seattle-San Francisco-Valparaiso route, and are to be fitted with extensive ventilation and cold storage equipment. There are to be forty cabins for first-class passengers and four cabins de luxe with bathrooms. Each vessel will have two Diesel motors of 2,800 h.p. of Burmeister and Wain type manufactured by Gotaverken and three auxiliary motors of 100 h.p. each for auxiliary purposes.

The total price for both ships is said to be slightly above one million dollars, to be paid in cash. This is the first time American owners have placed a contract for new vessels with Swedish yards, and Swedish shipbuilders are naturally highly interested in the possibilities of extending their ramifications which this opening up of a new market may offer them. The Gotaverken's bid for these vessels was twenty per cent lower than the lowest British tender.—*The Nautical Gazette*, 23 June, 1923.

Chicago to North Europe Steamship Service to Start.—Chicago, July 4.—Direct steamship service between Chicago and Great Britain and Northern Europe will be inaugurated August 15, when the first ship will leave Chicago for England, it was announced today.

Sixteen steel ships will be put into the lakes-ocean service, according to advices received from William Hansen, of Bergen, Norway, owner of the line, which will be known as the Lake and Ocean Steamship Company. These ships will be of 2,000 tons displacement.—*Baltimore Sun*, 5 July, 1923.

ENGINEERING

Engineer Training in the British Navy.—It may be mentioned that there are now two schemes of engineering training in operation, and under the new scheme inaugurated last year officers volunteer immediately on completing their training as cadets and pass into the Royal Naval College at Keyham as midshipmen, undergoing there a course of training which extends over a period of three years and eight months. The examination above referred to is for officers volunteering under the old scheme, and these officers have a six months' preliminary course at Greenwich and a twelve months' course at Keyham. We also learn that in future acting mates (E) will receive the whole of their training at Greenwich, whereas hitherto these officers have received a six months' course of instruction at Keyham. The change is due to the increased demand for accommodation at Keyham, arising out of the new training scheme above referred to. —*Engineering*, 8 June, 1923.

Trials of the Bristol "Cherub" Aero Engine.—We understand that the small Bristol "Cherub" aero engine, which has been designed for use on light aircraft, has recently completed the Air Ministry type test under the supervision of the Aeronautical Inspection Department, with very satisfactory results. The engine, which is of the flat twin type and has a cylinder capacity of 1,086 cub. cm., was subjected to a fifty hours' endurance test and ran for the whole period without a stop at ninety per cent full load. The average power developed was 15·4 h.p. at 2,200 r.p.m., and the average fuel consumption was 9·7 pints of petrol per hour; the oil consumption was 0·63 pint per hour. The power developed was absorbed by a Froude dynamometer, and a fan, coupled directly to the engine crankshaft, was used for cooling purposes. On the completion of the endurance test, and without any adjustment, the engine was run over a range of powers and speeds from 15 h.p. at 1,775 r.p.m. to 19·68 h.p. at 2,360 r.p.m., in order to obtain data for the construction of a power curve, and after this had been done a further run for one hour at full

throttle was made, the engine developing 18·5 h.p. at 2,200 r.p.m. Finally the engine was stripped and measured and found to be in perfect condition. We understand that this is the first engine suitable for light aircraft to be subjected to an official test.—*Engineering,* 8 June, 1923.

Improvement in Diesel Motors.—A Stockholm firm, A. B. Atlas-Diesel, is now putting on the market a new raw oil, high-pressure motor, invented by Mr. Uno Danielson, which functions in such a manner that the oil is finely sprayed when pumped into the combustion chamber without the use of compressed air. This is accomplished by an effective spreader of new design, the oil being pumped directly into the cylinders and meeting a very high temperature through compression, amounting to 28-29 atmospheres, ignited without the aid of electric sparks or other usual means of ignition.

The consumption of oil by the new motor is only about 180 grams per effective H. P. per hour, the consumption of lubricants being less than 1 gram per H. P. an hour.

It is claimed that the escaping gases from the new motor are quite free from smoke and odor.—*Consular Report,* June, 1923.

Steam at Terrific Pressure.—In the never-ending pursuit of fuel economy, boiler pressures in steam-power plants are being increased by leaps and bounds. While 550 pounds per square inch is the highest steam-pressure in strictly commercial use in the United States, two large boilers for 1,200 pounds' pressure are now being erected at Chicago and at Weymouth, Mass. Sweden is trying out a 1,500-pound boiler, and now an article in *Power* (New York) gives the details of a new British plant of 1,500 horsepower in which steam will be generated at the hitherto unheard of pressure of 3,200 pounds per square inch! The experiment with steam generation at this extremely high pressure is not made entirely on considerations of efficiency. In fact, the pressure will be reduced by throttling to 1,500 pounds before the steam is delivered to the high-pressure turbine. The explanation given is that, while the turbine will exhibit its best economy at 1,500 pounds, it is actually easier and safer to generate the steam initially at more than double that presure, because at 3,200 pounds' pressure water has a "critical point," and will slip quietly into steam without bubbling or boiling. In further elucidation of this point, the writer states:

"The chief difficulty at these pressures (1800 pounds and up) has been in the generation of the steam rather than in its use in steam turbines. Special precautions must be taken to guard against 'priming,' or the passing over of water in gulps, on account of the violent boiling under high pressure. It is principally due to the seriousness of this factor that pressures above 800 pounds have been attempted in only a few cases. The likelihood of priming increases with rising pressure as long as steam is generated by methods that require the addition of latent heat of evaporation with consequent ebullition.

"The development of steam generators above this pressure has been retarded, though to a less extent, by metallurgical difficulties. The extensive experiments carried out during the war, however, enabled a tremendous advance to be made in the production of steel and steel alloys of high tensile strength.

"The field has, therefore, been prepared for the introduction of a super-pressure plant using steam generated under 'critical' conditions, that is, with a pressure of 3,200 pounds per square inch and a temperature of 706 degrees Fahrenheit. The tremendous jump from 1,500 pounds to 3,200 is due entirely to the fact that, at any pressure below 3,200 pounds, latent heat must be added with consequent troubles from boiling and

priming. At the critical point there is no latent heat and no boiling, and this has enabled the designers to construct a generator with heating elements of very small section and without steam drums or chambers.

"The experimental plant now nearing completion, and soon to be erected in the works of the English Electric Company at Rugby, England, is equivalent to a 1,500 horsepower commercial plant. Steam will be generated at 3,200 pounds per square inch, then throttled to 1,500 pounds and, after being superheated to 768 degrees Fahrenheit, will be passed through a high-pressure turbine exhausting at 200 pounds. The exhaust of the high-pressure turbine is to be reheated to 662 degrees and then expanded in a standard normal-pressure turbine to a condenser maintaining a ninety-seven per cent vacuum."

The tubes of the steam generator and superheater have an internal diameter of only 0.8 inch, and are arranged in continuous coils heated by an oil-fired furnace. On account of the great density of the high-pressure steam a 1¼-inch pipe is sufficiently large to conduct the entire steam supply of the 1,500-horsepower plant to the high-pressure turbine. This, in turn, has but a single wheel of very small diameter which will rotate at from 20,000 to 25,000 revolutions per minute. It should be noted that the exhaust pressure (200 pounds) of high-pressure turbine is as high as the initial pressure employed in many modern plants. As to the results expected from tests to be made within a few months, the article says:

"The builders of the plant predict not only that it will consume about twenty-eight per cent less fuel than a normal-pressure, high-grade plant of the same capacity, but that it will also be cheaper to build and maintain. As a matter of fact, the actual test generator, complete with feed pump and fan, has cost less than a normal water-tube boiler for a plant of the same capacity, even though every part has been special. Further sets should, of course, cost even less."—*The Literary Digest,* 7 July, 1923.

A New Type of Double-acting Four-cycle Marine Diesel Engine.—The Swedish America Line, the managing director of which is Mr. Dan Broström, of Gothenburg, has recently placed an order for a large ocean-going twin-screw passenger vessel with Sir W. G. Armstrong, Whitworth and Company, Limited, of Walker, Newcastle-on-Tyne, which is to be propelled by double-acting four-cycle Diesel engines of a new type designed by Messrs. Burmeister and Wain, Ltd., and which will be constructed by that firm at Copenhagen.

The present order is the result of experimental work carried on for more than two years. This work has included the construction of an experimental engine of the new double-acting type with a single cylinder, developing 1,000 B.H.P. This engine has been in operation at the firm's experimental station at Christianshavn for four months, including continuous running day and night for about one month, and has given very satisfactory results.

The largest marine Diesel engines hitherto built of the Burmeister and Wain type have developed 300 B.H.P. per cylinder, and have been used in combined freight and passenger liners of 13,000 to 14,000 tons' deadweight, built as twin-screw ships with eight-cylinder engines developing in all 4,800 B.H.P.

The Burmeister and Wain new double-acting marine Diesel engine is a very important development, and opens a new field for the use of the marine Diesel engine. The double-acting engine will make it possible to build marine Diesel engines developing the necessary horsepower for the propulsion of fast ocean-going liners at the high speed required in such ships. The economy obtained by using Diesel engines for marine propulsion will thus be introduced in this class of vessel, where the economy is of more vital importance owing to the large horsepower required.

With the double-acting engine Diesel motor ships may be built as twin-screw ships in a similar manner to the steam reciprocating and turbine machinery installations now in existence, making it possible in this way to employ the same practical arrangement of the machinery without having to distribute the power over a larger number of shafts and propellers.

The machinery for the new passenger vessel for the Swedish America Line will operate twin-screws, and consist of two six-cylinder main Diesel engines of the new double-acting four-cycle type developing in all 13,500 B.H.P. during ordinary working conditions at sea. This power is estimated to give the vessel a speed of 17 knots. Further, there will be installed a complete set of auxiliary Diesel engines for operating the pumps, fans, etc., and for lighting purposes, consisting in all of six auxiliary Diesel driven dynamos with a total B.H.P. of 3,150. The complete machinery will be put on board the vessel at the yard of Sir W. G. Armstrong, Whitworth and Company, Ltd., Newcastle-on-Tyne, and the ship will be ready for service in about eighteen months.

The new Burmeister and Wain double-acting four-cycle Diesel engine may also be built as a long-stroke engine for a single-screw ship, thus being substituted for twin-screw machinery in the larger cargo and pessenger ships which have formerly been provided with Burmeister and Wain's short-stroke Diesel engines, and similar economy will thereby be secured. Diesel engines of the new type for single-screw ships can be built with powers up to 5,000 to 6,000 B.H.P.—*The Shipbuilder,* June, 1923.

A New Diesel Engine Called the Michel Motor.—The Michel Motor represents an improvement on the well-known Diesel engine. In a manner different from heretofore it transmits the power of the pistons moving back and forth in the cylinder of the Diesel engine to a rotation movement which is everywhere required in manufacturing.

The Michel Motor works on the familiar principle of the two-cycle engine. The transmission of power from the swiftly moving pistons to the shaft is carried out, not by means of connecting rods and crank shaft, but directly from the *piston-rods* by a system of cams. The cams are located in the interior of a closed rotating body which revolves around a fixed cylinder.

The Michel Motor has 120 horsepower and has only one cylinder with three compartments which are arranged star-fashion at angles of 120 degrees. For the three pistons only one fuel valve is needed. The valve controls are thus limited to a small number, since the Michel Motor, as a two-cycle engine is provided with distribution by means of ports. (Schlitzsteuerung). The cylinder is firmly attached to an engine bed which is fixed in the usual way to the base. On this engine bed is located a bearing (Lagerstelle) for the rotating body. On the other side the rotating body itself is connected by a simple flange connection with the shaft intended for the further transmission of power. Here is located a second bearing for the rotating body in the form of a normal running bearing (Lauflager). In operation the whole rotating body is in motion, like the corresponding parts of a turbine, around the fixed cylinder and transmits directly the power carried over from the pistons to the shaft. By eliminating friction in the machine, the mechanical effectiveness is said to be complete. With only 110 to 120 revolutions per minute with one cylinder and three pistons the machine achieves 120 horsepower, corresponding to a rating of a steam engine of 150 horsepower.

The engine is suitable not only for a stationary machine, but especially for a propelling machine for ships of every kind, and to drive auxiliary machines on ships. Its use as a stationary machine is unlimited. It could be used in automobiles and tractors. It may be used to equal advantage

for direct coupling with electric generators and for connection with belt wheels, rope pulleys and other driving apparatus. At present the motor is being built as:

Type B 1, with one cylinder and 120 horsepower with 110 to 120 revolutions per minute.

Type B 2, with two cylinders and 250 horsepower with 110 to 120 revolutions per minute.

Type B 3, with three cylinders and 375 horsepower with 110 to 120 revolutions per minute.

A special advantage of the Michel Motor is its small number of revolutions per minute, which, together with the light weight, and the small space occupied, is said to make it superior to the Diesel engine as hitherto constructed.

For ship's machines, and in all plants where necessary, the revolutions per minute can be changed at pleasure within the limits of 120 and twenty, and can be kept permanently at any figure.

The chief advantages of construction, briefly summarized, are as follows:

A great saving in weight. The Type B engine, which, with about 120 revolutions per minute, achieves 120 horsepower, weighs only about seven tons, whereas an old type Diesel engine of same horsepower weighs about twenty-seven tons. The costs of the foundation are extremely small, because the engine is excellently adjusted in all its parts and no concussions worth mentioning occur. The degree of uniformity is remarkably good, although there is no special flywheel. The engine possesses a high capacity for overload and on account of its small number of revolutions and its excellent adjustability is particularly suitable for propelling ships. The center of gravity of the machine is almost perfect thus securing a motion free from concussion. The type described above can be profitably used principally as the chief propelling power for ocean vessels and vehicles of every kind, and as the propelling power for auxiliary machines on ships; finally as stationary machine, particularly on account of its high degree of uniformity, its precision of regulation, and its wide range of adjustment of the number of revolutions to all conditions.

The writer was privileged to see this engine in operation as the engine power of an agricultural manufacturing plant at Kiel and was impressed by its simplicity, power and ease of operation. Only one man was required to operate this machine which is extremely compact. A good feature, illustrated to the writer was the speed at which the engine could be reversed. The reversal of movement was carried out while the engine was going at fairly good speed. It was reversed twelve times in one minute, each reversal being only a matter of several seconds.

This motor is being manufactured by the Michel Motor, Gesellschaft, Elmshorm, near Hamburg.—*Consular Report,* June, 1923.

A Cold-starting Oil Engine.—The oil engine shown below is one of a new series which has just been brought out by Petters, Limited, of Yeovil. It is of the two-stroke, sold-injection type, and is made in several sizes ranging in output from 5 up to 36 brake horsepower. The smaller sets have single cylinders.

The engine represented by our illustrations is the 36 horsepower model, and runs at 450 revolutions per minute, but it is capable of carrying a maximum load of 46 brake horsepower. The cylinders are 8in. in diameter by 9in. stroke, and work at a mean effective pressure of 44.5lb. per square inch for the maximum load. The compression pressure is 180lb. per square inch.

As will be seen from the line drawing—Fig. 3—the cylinder and crank case are made as one casting, while large openings are arranged in the

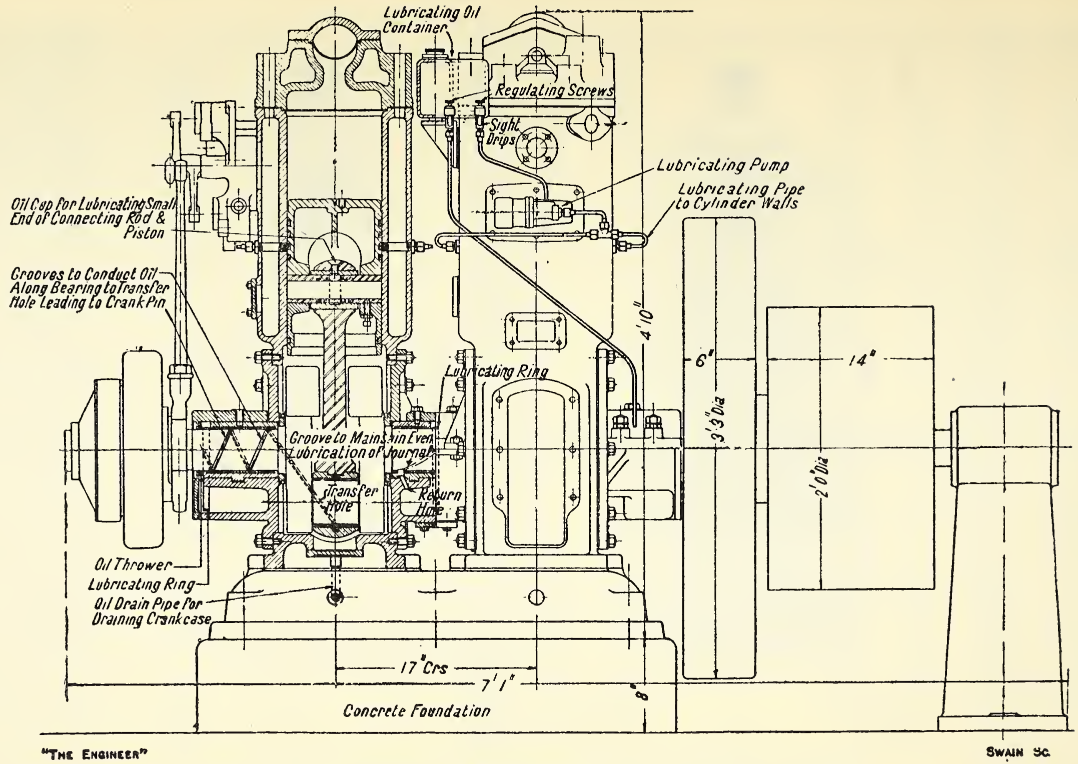


Fig. 3—Arrangement of Petter Solid-Injection Oil Engine

sides of the casings, so that the crank shaft may be threadled into place. The openings are closed by cover plates, which have spigots to ensure correct alignment, and carry the main bearings. It will be noticed that the bearings are all entirely outside the cover plates, so that when their keeps are removed, the brasses can be taken out by twisting them round the journals.

The main bearings have oil wells that are fed from a reservoir, between the two cylinder heads, through sight feeds. The oil is picked up from

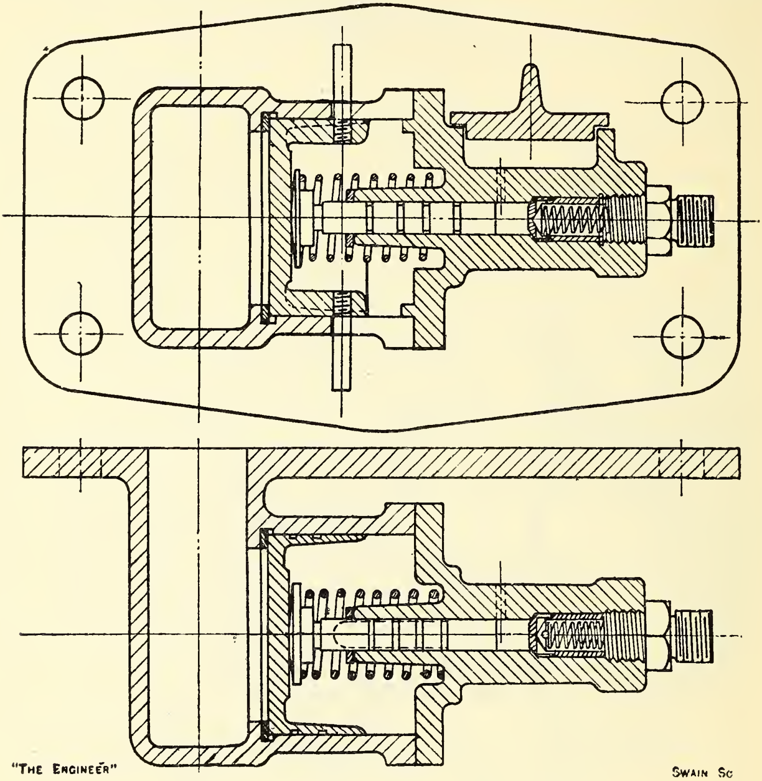


Fig. 2—Piston-Lubricating Pump

these wells by rings and fed to the journals in the normal manner. In the case of the two outside bearings, the rings are at the outside ends, and the oil is carried along the journal by a spiral groove cut on the shaft. At the inside end this groove terminates at a hole that is drilled through the crank web to the crank pin. The rotation on the shaft screws the oil along the spiral groove and forces it through the hole to the crank pin bearing. The oil escapes from the big end into the crank chamber, and is splashed up to lubricate the gudgeon pin. Any oil which may be forced outwards along the main bearings by the compression pressure in the crank case is trapped and drained back to the oil well.

For lubricating the piston, a small pump is mounted on the front of

each cylinder. This pump, which is shown in detail in Fig. 2, is operated by the variation of the air pressure in the crank case. It has a comparatively large piston, working in a barrel that is in communication with the crank case, and a smaller plunger for forcing the oil forward. The areas of the piston and plunger are in the ratio of 15 to 1, and as the compression pressure is about 4lb. per square inch, the oil is delivered at a pressure of some 60lb. per square inch. The oil is supplied to the pump by a sight feed, and is delivered to four points round the cylinder walls.

A noteworthy feature about the engine is the provision of a device for starting it expeditiously from cold. This device, which we illustrate in Fig. 4, takes the form of a small container which is screwed into the vaporizer in such a position that the fuel spray impinges upon it. On

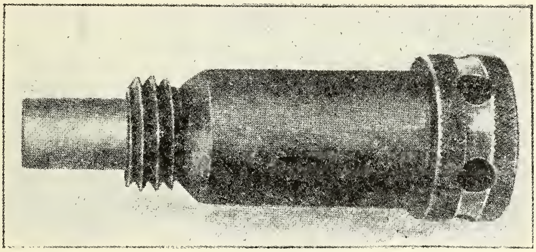


Fig. 4—Cold-Starting Device

starting up the engine, a cartridge of impregnated tinder is slipped into the container and is lit with a match. The heat generated by the combustion of the tinder is sufficient to explode the first charge in the engine, and will keep the end of the container sufficiently hot to maintain the explosions until the engine has got under way, and the hot bulb has warmed up.

The makers say that these engines will run indefinitely on no load without any secondary injection to keep the bulb hot, and claim a fuel consumption of half a pint of oil per brake horsepower per hour.—*The Engineer,* 22 June, 1923.

The Flettner Rudder on the Motor Ship "Odenwald."—In the present article we describe the rudder which has been installed on the Hamburg-American liner *Odenwald,* built at the Deutscher Werft, Finkenwärder, Hamburg, a new twin-screw motor ship which is now on her maiden voyage to South America.

The general principle upon which the working of the rudder depends is illustrated by the drawing reproduced in Fig. 3.

The object of the invention is to do away entirely with heavy and expensive steering gears and to replace them by a simple form of rudder worked by the stream line pressure exerted on the rudder by the water through which the vessel is moving. This end is accomplished by a small auxiliary rudder or deflector B, which is placed at the back of the main rudder plate A, and which by its movement turns the main rudder. The combined effect of the small deflector working at a long leverage and the power of the current of water acting on the whole system imparts to the main rudder a large turning movement enabling it to act with a prompt and energetic steering action. The general arrangement of the two rudders and the operating gear will be seen from the drawing. The motion of the small rudder is controlled by the pair of yokes C with horizontal interconnecting rods C^1, which are operated by the control shaft C^2 passing

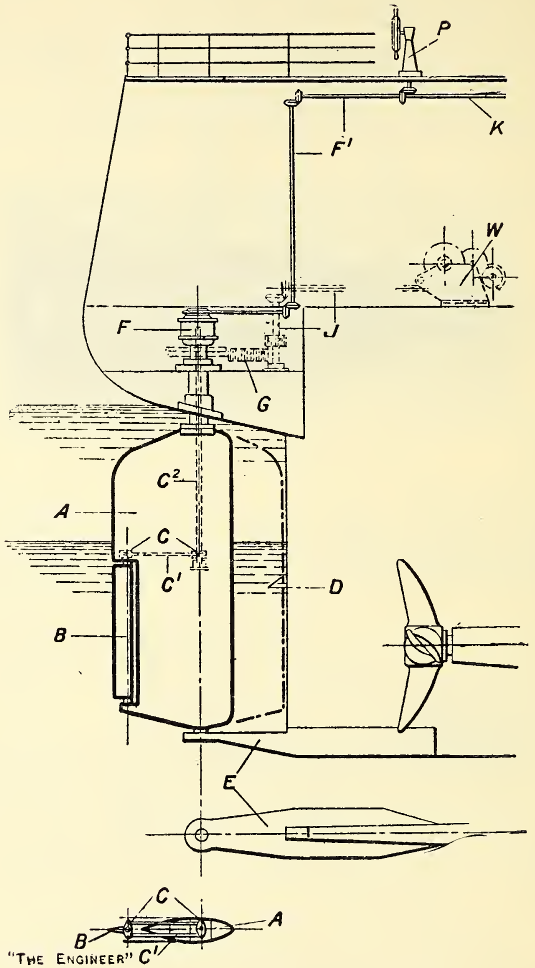


FIG. 3—DIAGRAM SHOWING WORKING OF FLETTNER RUDDER

vertically through the hollow axis of the main rudder, which is connected to the gear-box F at the head of the main rudder post. Pivoted at its lower end on the support E and turning in upper bearings, the main rudder is independent of the turning gear for the small rudder and is quite free to take up any position. When the vessel is going astern it moves through 180 degrees into the position indicated by the dotted lines D, and then acts as a bow rudder. In this position the steering principle remains the same. The rudder system acts very promptly under the influence of the propeller suction, the main rudder turning under the influence of the astern running propellers even before the motion of the ship herself has begun to reverse. On the *Frigido* the small deflector was controlled by a steel wire rope passed round a drum fixed at the upper end of the vertical shaft and connected with the wheel on the bridge. The arrangement adopted on the *Odenwald* consists of the usual system of 1in. diameter steering gear shafting connecting the gear-box F with the Flettner steering wheel P on the poop, and further through the shaft K with the main steering wheel on the bridge. An electric winch W serves as an emergency steering gear, and may be connected to the spare tiller G by means of the intermediate shafting J. The main rudder has a total area of surface of about 140ft. while the deflector has a surface of about 12ft. Both the deflector and the large rudder, which are partly balanced, are fish-shaped in horizontal section.

During the thirty hours' trial of the *Odenwald,* the Flettner rudder installation worked with satisfaction, the ship being steered only by the hands of the steersman. Experience showed, however, that the friction in the steering gear shafting and transmission wheels was unnecessarily large compared with the actual effort required to turn the deflector. This friction could be greatly reduced by fitting ball bearings to the steering gear shafting, which will probably be done later. The question of adopting a telemotor gear between the deflector and the bridge wheel has also received favorable consideration.

The Hamburg-American Line, the owners of the *Odenwald,* have combined the Flettner installation with another invention of not less importance, namely, the Anschütz self-steering gyroscopic compass. The well-known gyroscopic compass of Dr. Anschütz has been further developed by the inventor to act as a steersman. This result has been obtained by the following method: At the circumference of the compass a series of electric contacts are provided at small intervals, opposite to which is a single contact which is fixed to the hull of the gyroscope. In the lower part of the compass housing there is a one-half horsepower electric motor, which is coupled by a chain to the axis of the steering wheel. The motor is controlled by the system of contacts on the compass, and is propelled in either the one or other turning sense depending on the turning motion of the ship. The course is set by the officer on watch, after which the vessel is automatically steered and continually corrected by the gyroscope. It is claimed that the steering is more exact than that of the steersman, and the human element is moreover eliminated. The combination of the Flettner rudder with the steering compass certainly marks an interesting development in navigating machinery, and the further progress of this system will be watched with interest.

The *Odenwald* ran her trials in the Bight of Heligoland on the first and second of last month, and seven days later started on her maiden trip to South America. Built to the Germanischer Lloyd Classification 100 .4 L special survey, she has the following particulars: Length between perpendiculars, 398ft. 3in.; beam, 53ft. 11in.; moulded depth, 38ft. 3in. Her draught when loaded is about 26 ft. 3in., and she has a deadweight capacity of 9,000 tons all told, with a gross registered tonnage of about 5,000 tons. The machinery comprises two 1,250 indicated horsepower Diesel engines,

which are designed to give the vessel, when loaded under service conditions, a speed of 12½ knots.—*The Engineer,* 22 June, 1923.

An Analysis of Claims of the Electric Drive Over the Geared Drive.—Various articles and papers have been published and read, from time to time, in the technical press and before the different societies advocating the steam-electric drive for marine propulsion. These have been conspicuous by the scarcity of any real figures to substantiate the claims for the superiority of this drive, the data being mostly theoretical, and based on assumptions generally better known to the authors.

An excellent example of one of these articles is that which appeared in the May issue of *Marine Engineering and Shipping Age* by Messrs. Watson and Thomas, of the General Electric Company, entitled "How to get a Shaft Horsepower for All Purposes with Steam on from 0.75 to 1.00 Pound of Oil."

They have entirely begged the question, as they do not inform the readers any details as to "how" this is to be accomplished. They present the usual theoretical curves for economy, consisting in this case of water rates and oil consumption for all purposes per shaft horsepower as ordinates and normal shaft horsepower of the vessel as abscissæ, the power varying from approximately 3,000 for the cargo ship to 22,000 for a liner.

Two sets of curves are shown, based on 200 and 250 pounds steam. The article is also illustrated with pictures of the electric driven ship *Independence.*

In the June number of *Marine Engineering and Shipping Age,* furthermore, there is given the specification of a proposed liner of 10,000 shaft horsepower in which the electric drive is proposed to be used, the oil consumption being here stated as 0.85 pound for all purposes per shaft horsepower, but which figure is also seriously to be questioned.

Thinking that readers of *Marine Engineering and Shipping Age* would be particularly interested in some actual figures obtained in service with the electric drive, in contrast to what has been published for advancing its cause by its advocates, the author presents that which follows:

The electric drive has now been installed in five vessels belonging to the Shipping Board and has accordingly been given a thorough tryout for this particular service by competent operators. Several battleships in the United States Navy have also been built, employing the electric transmission, and it can be unreservedly stated that the actual results for either type of vessel, which are now available, fall far short of the claims made by its sponsors.

The five Shipping Board vessels referred to are the *Eclipse, Independence, Archer, Victorious* and *Invincible*—the *Independence* being used, as previously stated, to illustrate the article of Messrs. Watson and Thomas. These vessels originally had geared turbine machinery, which proved unsatisfactory in service due to defective gearing.

These vessels have a length of 440 feet between perpendiculars, a beam of 56 feet and draft of 28 feet and 7 inches, corresponding to 15,700 tons displacement. The block co-efficient, which is 0.68, is unusually fine, and the vessel is accordingly suitable for considerable more speed than the original designed speed of 11 knots, corresponding to 3,000 shaft horsepower with propellers running at 90 revolutions per minute.

The old geared turbine, of General Electric type, consisted of five stages, operating at 3,600 revolutions per minute and driving through a single pinion double reduction gearing. This turbine was replaced by one of the same general design, but having no reversing wheels and incorporating more stages and other improvements tending to better the thermal efficiency. The later turbine is coupled to a generator rated at 2,360 kilowatts, which supplies three phase current at 2,300 volts to an induction

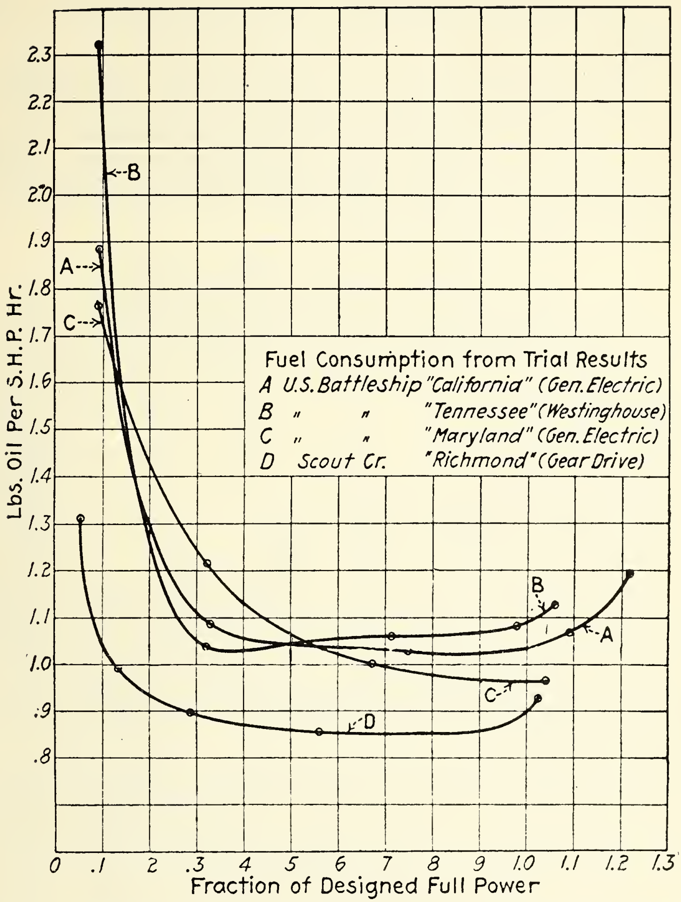


FIG I.—COMPARISON OF FUEL CONSUMPTIONS FOR ELECTRIC DRIVE AND GEARED DRIVE, BASED ON FRACTION OF DESIGNED FULL POWER

NOTE—Designed power: battleship, 28,500; scout cruiser, 90,000. Battleships use superheated steam, scout cruiser saturated steam.

motor rated at 3,000 shaft horsepower, running at 100 revolutions per minute and direct-connected to the original shafting. The blades of the propeller were set to the minimum pitch permissible, for favoring the installation of the motor, which was limited as to diameter and corresponding maximum number of poles that could be employed, the designed revolutions being increased from 90 to 100 revolutions per minute for the 11 knots.

The boilers, which are Scotch with Howden draft, are the original, but superheaters of the Schmidt types were added to give approximately 200 degrees superheat, which, with the more improved design of turbine, was expected to more than counteract the inherent electrical losses, calculated as not over ten per cent, with eighty per cent power factor. The latter, however, works out in service about seventy per cent, reducing thereby the effective capacity of the generator with a corresponding increase in the I^2R loss due to the wattless current.

Performance of the "Eclipse"

The first of these vessels to be converted was the *Eclipse,* which was put into service the early part of 1921, and the following data were obtained on the maiden voyage, initiating the new drive:

Total distance, nautical miles	23,611
Mean speed, knots	9.78
Fuel consumption	33.2
Shaft horsepower	2,422
Pounds of oil per shaft horsepower	1.28
Superheat, degrees	198
Boiler pressure, pounds per square inch	214
Chest pressure, pounds per square inch	189

The conclusion reached by the operating company as a result of their experience with the vessel on this voyage, which was arrived at by comparing results with a voyage made before the vessel was changed to electric drive, was that the consumption was increased by ten per cent over that of the original gear drive. Furthermore it was estimated that had the new installation not been equipped with the superheaters the fuel consumption for the electric drive would have been twenty per cent more, instead of ten per cent.

Subsequent data obtained from the *Eclipse* in service, and her sister ships, substantially confirm this original unfavorable report, checking very closely the figures obtained on the first voyage of the *Eclipse.* These additional data are shown in Table I, which is made up from the ship's logs, taking the best portions of voyages uninfluenced by adverse weather conditions. The light draft operation of the vessels have been eliminated, and only those portions approximating normal draft conditions have been employed for the general averages shown in the last column. The third column has been inserted to show the effect of draft on speed and economy for the *Independence.* The averages for power and revolutions are arrived at by multiplying same by hours and dividing by total hours. The average power, it will be noted, is 2,396 shaft horsepower, corresponding to 9.92 knots, and which is estimated ten per cent too high for the particular speed. This poor propulsive efficiency is no doubt due to the high turns of the propeller employed to favor the motor, as previously stated.

Comparing the above results with a modern compound marine turbine, using saturated steam, the oil consumption per shaft horsepower is about thirty per cent greater for the electric drive using superheated steam. This is based on 1 pound of oil per shaft horsepower, which is easily being realized in service with the first drive with properly co-ordinated auxiliaries.

Using the same degree of superheat the difference in favor of the geared drive would be still more marked, based on the same propulsive efficiency for either drive.

Results with Electric Drive on Naval Vessels

Referring to the results that have been obtained in the Navy with the electric drive, as compared with the geared drive, this is best seen graphically in Fig. 1. Curves "A" and "B" for the battleships *California* and *Tennessee* are seen to have the same general characteristics, though ma-

TABLE I—PERFORMANCE OF ELECTRIC DRIVEN SHIPS

Eclipse—Independence—Archer—Victorious

	Eclipse	*Independence* No. 2		*Archer*	*Victorious*	Average for
Voyage	No. 2 (A)	(B)		No. 2 (C)	No. 1 (D)	A-B C & D
Route	Savannah to Otaru via Panama and Honolulu	Balboa to Yokohama via Honolulu	Saigon to Havre via Singapore and Port Said	New York to Yokohama via Panama and Yokohama	Cristobal to Yokohama via Honolulu	....
Mean draft	28′ 8″	24′ 10½″	22′ 7″	28′ 8″	28′ 3″	27′ 8″
Mean displacement (tons)	15,950	13,748	12,325	15,665	15,605	15,450
Total hours (bar to bar)	1,062.25	787.61	809.97	1,014.9	820.7	3,685
Total distance, miles	9,894	8,235	8,630	10,316	8,081	36,526
Mean speed, knots	9.31	10.58	10.67	10.17	9.85	9.92
Mean S.H.P.	2,224	2,365	2,437	2,766	2,200	2,396
Fuel consumption at sea (tons)	1,363	1,143	1,165.5	1,456.4	1,150	5,112
Fuel consumption at sea, tons–24 hrs	30.8	34.87	31.6	34.5	33.6	33.3
Mean R.P.M.	88	96.4	92.2	92.4	87.2	90.8
Mean lbs. per S.H.P.	1.292	1.375	1.326	1.165	1.427	1.297
Boiler pressure	210#	205#	208#	....	....	....
Superheat	195°F.	195°F.	214°F.	....	....	....
Vacuum (inches)	27.5	28	28.4	....	....	....
Miles per ton fuel	7.26	7.20	7.4	7.08	7.03	7.15
Pounds fuel per knot	309	311	303	316	319	313

chinery was supplied by the two independent electric companies interested in this drive. Curve "C," shows the consumptions for the *Maryland*, and is from the only battleship trial data, showing oil consumptions, published heretofore regarding these vessels. It is to be noted that it has an entirely different characteristic to the other two curves, and which is apparently due either to the method of measuring the oil or not including all the auxiliaries in this measurement.

The battleship has two screws and two turbines, while the scout cruiser has four screws and four sets of turbines with a boiler room separating the forward and after independent engine rooms. The scout cruiser is acordingly equivalent to two battleship installations of 45,000 shaft horsepower, and comparable with the present battleship installations of approximately 30,000 shaft horsepower.

Comparing the results of the scout cruiser, shown by curve, with the mean of "A" and "B," it will be observed that the electric drive requires, on an average, eighteen per cent more oil per shaft horsepower at full power, twenty-two per cent more at one-half power, and about ninety per cent more at one-tenth full power, the latter corresponding approximately to the 10 knots cruising speed of battleships. The scout cruiser is handicapped, furthermore, at full power due to the much higher rate of oil burned per square foot of heating surface, eighty per cent of full power of the *Richmond* corresponding to about the normal full power condition of the battleships.

The foregoing, therefore, entirely disproves the most cherished claim of the electrical advocates, which is for higher economy at the reduced or cruising powers.

The gear drive has certain inherent advantages for improved thermal efficiency, which are not common to the single unit turbine, as necessarily required for coupling to a generator. This is because the gear easily permits of cross compounding of turbine, thus permitting the turbine blading design to approach the ideal conditions for best efficiency.

At approximately one-half power for the cruiser, additional blading is cut in on the forward end of the high pressure turbine, and one-quarter full power additional blading is put into action. These additional groups of blading carried are designed for maximum efficiency for the particular power and speed at which they are put into operation.

For the cruising speeds of 20 knots and under, a special high speed cruising turbine is employed in each engine room, coupled to the forward end of one of the high pressure turbines through additional gearing. These take the high pressure steam first, exhausting to the forward ends of the high pressure turbines, or the one-quarter power belts. It is for this reason principally that the scout cruiser at one-tenth power actually shows about the same economy as the electrical battleships at full power. The inherent electrical losses, due to the electrical transmission, are given as ten per cent at full power and twenty per cent at one-tenth power, which latter is based on one-half the power plant in operation for favoring the economy at this speed.

Advocates of the electrical drive have also frequently made other claims besides that of economy, as, for instance, greater reliability with freedom of troubles, greater flexibility of drive and simplicity of control than that with the geared turbine arrangement. These are far from being the actual case.

The William Cramp and Sons Ship and Engine Building Company has built at the present time over a million horsepower of geared turbines without once encountering gear trouble, and other experienced marine builders can testify to the same experience.

As to the cargo ship arrangement having the electric drive, in which there is only one turbine coupled to generator and the one motor driving propeller, if there is trouble with any one of the units, the vessel has to be completely stopped. It is for this reason alone that many experienced shipowners will not consider the electric drive, and for the same reason it is looked on with disfavor by the underwriters. This is not so with the single screw compound geared turbine arrangement, which, in case of damage to either high or low pressure turbine, or their respective pinions, is only one-half as likely to be put entirely out of commission, special piping being provided for permitting either turbine to operate in such a contingency.

The electric drive has other well known disadvantages not common to the steam drive.

There are the necessity for having a specially trained engineer force, the liability of short circuits in the windings on account of moisture, the ever present danger with the high voltage employed and the defects of the induction or synchronous motor when used for this service.

At the present time there is a leaning toward the synchronous motor by the electrical experts, due to the induction motor's small air gap, and the all inductive load it imposes on the generator with resultant low power factor.

The synchronous motor, however, requires a more complicated starting gear and is more prone to fall out of step when much overloaded. This latter operating defect is particularly apt to occur in rough weather with

the cargo ship, in which the power is small in proportion to the displacement, when there occurs a large variation in the torque. In the case of two screws, or more, driven by motors supplied by current from a common alternator, the screws are locked together by the synchronous speed of the generator. This makes for bad maneuvering and it is for this reason that the electrically driven battleships require that both generators be in operation when making port, which is so that each motor will have its independent source of power.

The claim for greater simplicity of control for the electric drive is far from being correct, as shown by the multiplicity of levers, switchboard instruments, rheostats, synchronizing devices, etc.

Other arguments that have been made against the gear drive for advancing the cause of the electric drive are that there are losses due to the astern turbine being rotated idly when going ahead, lack of ability of the astern turbine to develop the full ahead power, and the possibility of trouble with astern blading when high temperature steam is admitted to it suddenly.

The first of these can be dismissed by pointing to the low oil consumption on the scout cruiser and similar vessels.

As to the backing power, this feature has no practical value, as it bears only on the maximum speed of the vessel that can be eventually attained in the astern direction and not on the actual ability to stop and maneuver. Furthermore, too much power applied to a propeller, with the blades working on their backs, produces cavitation and nullifies the purpose intended.

In reply to the last point, it can be said that in all modern geared turbine installations there are generally fitted special impulse turbines of rugged design, and the argument against derangement of same is entirely fallacious, there being no record of a single case where trouble has been experienced of this nature when so fitted.

The electric drive is both more expensive and heavier which varies with the class of vessel.

For a vessel of the scout cruiser type the weight is about 300 tons more, with the cost about twenty-five per cent greater.

From the foregoing it is evident that the electric drive is far from fulfilling the promises of its advocates, and it is this which possibly explains their reluctance to publish anything other than theoretical figures pertaining to same.

Some comparisons have been made by the electrical advocates using the old direct steam installations for this purpose, but which have no particular bearing on the subject, on account of this earlier drive having for some time not been considered for new construction.—J. C. Shaw, Assistant to Chief Engineer, The Wm. Cramp and Sons, S. and E. B. Company in *Marine Engineering and Shipping Age,* July, 1923.

Packard Model 1551 300 hp. Airship Engine.—The six engines which will drive the Navy's great airship, the *R1* now nearing completion at Lakehurst, N. J., are being built by the Packard Motor Car Company, at its factory in Detroit. All are expected to be complete in time for installation about July 1.

One of the engines recently tested at Philadelphia Navy Yard met every requirement and drew enthusiastic praise from the Navy officers who witnessed the trials. The engine is of the same type as the Packard engine which was given a 300 hr. test last summer, the first aviation engine ever to pass successfully through such a rigid trial.

The engines are of the six cylinder in line vertical type. They are water-cooled and have a bore of 6⅝ in. with a stroke of 7½ in., giving a

piston displacement of 1551.24 cu. in. The rated horsepower is 300 b.h.p. at 1,400 r.p.m.

The crankshaft has seven main bearings with diameters of 2.875 in. and the following lengths: propeller end 3.375 in. intermediate 2.5 in., center 3.25 and front 2.625. The crankpin diameter is 2.875 in. and crankpin bearing width 3.125. Connecting rods are 12.75 in. long. Pistons are die cast of aluminum alloy. The compression ratio is 6.5 to 1.

The crank case is of the box section type, parted on the center line of the crankshaft. The main bearing bolts are carried through the crank case to receive the cylinder hold down bolts.

Cylinders are of the built-up individual steel type, reversible in respect to inlet and exhaust ports. Provision is made for positive lubrication to the cylinder bore. There are two inlet valves to each cylinder. Valves are made of high tungsten steel. They are 2 in. in diameter in the clear with 30 deg. seats. Inlet valves lift 7/16 in. and exhaust valves ⅜ in. There are two concentric springs on each valve.

There is a double rocker arm to each pair of valves with a single push rod. The rocker arm ratio is 1 to 1.405 and there are two roller bearings on a ½in. shaft. A force feed grease system is used for lubricating the rocker arm. A double impeller centrifugal pump running at one and a half engine speed is used in the cooling system.

Delco ignition system is used and there are four spark plugs to each cylinder. There are two six-cylinder duplex distributers and four ignition coils in Bakelite cases mounted on the instrument board. The generator is a 12-volt constant current type running at one and a half engine speed. A hand crank with automatic engagement and disengagement and geared 10 to 1 is provided for starting.

The equipment on the instrument board includes the following: acetylene primer, double ignition switch with ammeter, vibrator and starting switch, tachometer, high pressure oil gage, low pressure oil gage, outlet water thermometer, oil inlet thermometer, reverse current relay, throttle control, spark control, mixture control, automatic shut-down unit and four ignition coils.

Because of the necessity of directing the exhausts away from the ship both right and left hand engines are provided. The right hand engines are so designed that exhausts are on the right side and the engine rotates clockwise looking toward the propeller. Left hand engines run counter-clockwise and exhausts are on the left side.

For right hand engines the water pump generator and exhaust manifold are mounted on the right side and governor, carburetor and inlet manifold and ignition interrupters for standard service are on the left. All these units are shifted to opposite sides on the left hand motors.

The weight of the engine complete with instrument board and hand starter is 1,100℔ and the weight of the water in the engine 50 ℔.

Tests of the engines which have been made gave a maximum of 350 b.h.p. at 1,400 r.p.m. and a normal rated horsepower of 300 at 1,400 r.p.m. The maximum fuel consumption was 0.5 lb. per b.hp. hour at 1,400 r.p.m. with a normal fuel consumption of 0.45 lb. per b.hp. hour. The maximum oil consumption at 1,400 r.p.m. was 0.03 ℔ per b.h.p. hour and the normal 0.02 lb. per b.hp. hour.

The oil supply is carried in a tank with a capacity of 8 gal. located on the floor beside the engine. The oil is led from the bottom of this tank through a shut-off valve to the inlet connection provided on the oil pump, this being the lower of the two connections. The oil then passes through the pressure pump which corresponds to the outer set of oil pump gears or those furthest removed from the engine. The oil is then discharged through the passage at the upper left hand portion of the pump which passage communicates with a pipe fastened in the timing gear case and

leading up to the under surface of the oil controller. The oil then passes through a two-way cock which determines which of the two strainers is in use and which permits of cleaning the strainers one at a time while the motor is running.

After passing through the oil strainer the oil returns through the cock and can then take two paths, one down through the crankcase and the other through the horizontal main high pressure relief valve. The adjustment of the tension on this valve spring determines the oil pressure carried through the main lubricating system and at 1,400 r.p.m. this pressure should be from 75 to 100 lb. The overflow from this high pressure relief valve passes through the low pressure relief valve which occupies a vertical position at the center of the controller. Between these two relief valves a connection is provided for the pipe supplying oil for cylinder lubrication.

The crankshaft is hollow and in the center of each main bearing a radial hole is drilled through the shaft into the hollow center. This hole in the shaft registers with a corresponding hole and groove in the main bearing once every revolution of the shaft at each time a small quantity of oil is forced through into the hollow crankshaft. A passage leads from each hollow main bearing to the adjacent crank pin which is also hollow. A radial hole in each pin lubricates the pin. A tube fastened to the connecting rod carries oil through the connecting rod big end bearing to the piston pin bearing. At the timing gear end of the engine the oil pump driving idler shaft is also lubricated under pressure as well as the cam shaft idler driving gear bushings. Additional passages carry oil up to the cam shaft bearing at this same end of the engine. The cam shafts are hollow and provided with holes at each cam shaft bearing so that these parts are all pressure lubricated. A passage is provided around the inlet cam shaft bearing at the timing gear or control end of the engine and communicates with a special fitting fastened to the crankcase directly over the cam shaft. From this point the oil is led by an external pipe to the governor and after passing through the governor is led by another pipe to the control board. At this point the oil line connects with the throttle control unit.

A manifold running the length of the engine parallel and close to the inlet cam shaft communicates with drilled passages which project through the top surface of the crankcase and register with drilled holes in the cylinder flange. These holes extend upward for a short distance in the cylinder barrel and then meet another hole drilled through the cylinder bore. In this way oil is positively fed to the cylinder bore on the inlet side which is that side of the bore exposed to the greatest thrust from the piston. The vertical passages through the crankcase are restricted at the upper end to prevent too copious a flow of oil onto the pistons.

The oil which is thrown off from the connecting rods and main bearing and cylinder walls falls by gravity to the bottom of the crankcase and is sucked out by either one of two scavenging pumps.

The throttle control unit constitutes a semi-automatic means for controlling the engine. It is linked to the carburetor throttle and a tension spring is arranged to return the throttle to the idling position unless the throttle detent is engaged with the throttle sector, which results in locking the throttle in any position in which it may be left by the operator. In order, however, to have this detent stay engaged it is necessary to have a sufficient oil pressure built up on the back of the diaphragm which is mounted in a casing behind the control board, to overcome the pressure of the spring surrounding the plunger which extends through the control board. This spring requires over 25 lb oil pressure to move the plunger all the way out. This means that should the engine be running without an operator holding the throttle in place it will automatically throttle itself down to idling speed should the oil pressure drop to less than 25 lb. at any

time due to lack of oil, burnt out bearing, broken connection or any similar failure. This same mechanism will return the throttle to idling position should the engine race at any time over 1,500 r.p.m.

The purpose of the governor is to prevent the engine exceeding a predetermined speed in the event of the propeller breaking, clutch disengaging or slipping, or any similar accident which might relieve the engine of part or all of its load. The governor is of the centrifugal type and is driven by a gear meshing with the inlet cam shaft gear, the governor shaft projecting through the front of the timing gear case and driving the inlet ignition distributor. This governor functions by cutting off the supply of oil to the automatic throttle control and in this manner causes the automatic control to bring the engine down to idling speed in the same manner as when the oil pressure is reduced due to any other cause.

The ignition system is of the battery generator type in which the battery furnishes the source of current for starting and slow speed running, and at higher speeds the battery is "floated on the line" being charged by a generator which is run off the end of the pump shaft. The distributors are of the closed circuit type. Two double distributors are used on each engine giving four simultaneous sparks to each cylinder.

The Model 1551 cylinder is composed of a series of steel forgings welded together with a sheet metal water jacket surrounding the cylinder barrel. The complete cylinder is machined and ground on all important surfaces so as to constitute an interchangeable unit. Extraordinary rigidity is obtained in the cylinder head by pressing a thick steel plate over all four valve ports, this plate being then welded in place, making a girder reinforcement for the cylinder head. The rocker arm supports are forged integral with the interchangable inlet and exhaust port flanges and these supports or brackets are further strengthened by tie rods extending across the cylinder.

The model 1551 engines have been especially designed to facilitate the removal of individual cylinders in case of necessity. The cylinders are held down on the crankcase by means of four crabs, which in turn are held by four cap screws which screw into the heads of the main bearing bolts.—J. G. Vincent, Vice-president of Engineering, Packard Motor Car Company, in *Aviation,* 25 June, 1923.

New Discovery in Mechanics May Eliminate Gear Trains.—Pittsburgh, July 4.—A little piece of steel mechanism in Machinery Hall, Carnegie Institute of Technology, today defied all hitherto known laws in mechanical engineering and demonstrated the harnessing and application of a mechanical power apparently never before known or suspected.

The little power-maker was simply a section of a cased shaft. The driving end of the shaft, turned by a five horsepower motor, was speeded up to 17,000 revolutions a minute. The other end of the shaft was turning at the rate of only five revolutions an hour and devoloping power which has been impossible to measure.

It has been tested up to the lift of twelve tons. All this miracle in reduction in speed and gain of power is accomplished in a single gear unit.

The new principle makes it possible to do away with all the complicated trains of gear in automobiles, hoists, air compressors, rock breakers, belt-conveying machines, elevators, mechanical stokers, metal-shearing and punching machines, spinning and weaving machines and all others where the main shafting or drive is run at high speed.

In its simplest form the new "gear" does not have a single cogwheel or even a wheel with a single tooth. One end of the driving shaft is spigotted into the end of the driven shaft, turning free in it on ball bearings. Instead of resting in a journal, this driving or high-speed shaft on its outside circumference turns between three or four rollers, one or two of

which are larger than the others. These rollers roll on the inside of a steel ring, slightly off center. As the inner rollers turn on the high-speed shaft, the outer ring becomes the driving gear. The difference in the diameters of the parts establishes the rate of reduction in speed and increase in power.

The larger roller or rollers continually try to maintain their position in the circular wedge, so that no pressure has yet been found to make the shaft slip, the point in the new machine which has puzzled engineers.

In extended form, effecting reduction of speed from thousands of revolutions a minute to one an hour, the outer wheel ring is converted into a cog wheel, engaged by direct connection with the drum of a hoist or other machinery. Even in this form the gear is not one of cogs, strictly speaking, since the greater number of teeth are always in mesh. In either form the new gear does away with a brake.

The inventor of the new gear is George Smith Morrison, an Australian, who is now in Pittsburgh.—*Baltimore Sun,* 5 July, 1923.

A New Type of Deep-well Pump.—A new type of deep-well pump (Axiflo) has recently been developed by the Worthington Pump and Machinery Corporation, operating on a principle heretofore not used in pumps of this kind. Although the pump is of the rotary class the water

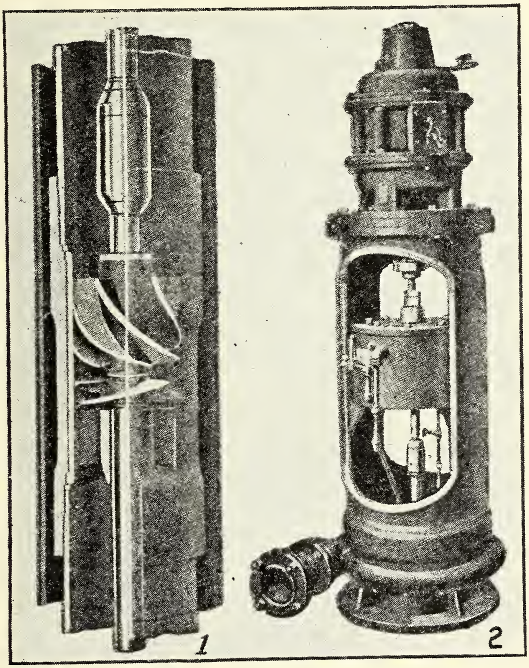


Fig. 1—Arrangement of the Impeller and Discharge Vanes

Fig. 2—Direct Motor-Driven Head, Thrust Bearing Housing, and "Booster" Pump

is not elevated by means of a conventional type of impeller, but a form of propeller is used similar to that employed for propelling ships.

The most radical departure in this pump is shown in Fig. 1. This is a section through a well casing and drop pipe. It illustrates one set of discharge vanes, the impeller, the shaft, the shaft coupling and the bearing.

In comparatively shallow wells one set of impellers might suffice, but in deep wells, a number of impellers are necessary, these being placed one under the other, thereby making the pump equivalent to a two-stage, three-stage or other multi-stage pump.

Where it is desired or necessary to operate this pump by means of a horizontal motor, a steam engine, or by other means through a horizontal drive, a vertical pulley for belt driving may be placed on the head.

Where water must be elevated to a considerable height above the ground level, a centrifugal "booster pump" is added and connected to the pump shaft at the ground level. This combination gives a compact unit the same as would be ordinarily obtained by using two different pumps, one for deep-well pumping and the other for above-surface elevating. Fig. 2 shows this booster pump at the bottom with the discharge pipe emerging at the left. At the top is a standard vertical motor. Midway between the top and bottom is shown the housing for the thrust bearing.

The impellers are made of hard bronze, capable of withstanding the corrosive action of the usual well water. The discharge vanes, clearly shown above the impeller in Fig. 1, receive the water from the impeller and convert the velocity of flow into pressure and at the same time cause the water to flow upward smoothly along the axis of the pump. These vanes eliminate eddy currents and their accompanying waste.

The weight of the moving parts and the water-column thrust is taken up in a specially designed three-plate self-adjusting-type bearing that runs submerged in oil. The oil-bath is water-jacketed, a constant circulation of water being supplied by a small impeller attached to the pump shaft. The piping for water circulation is visible in Fig. 2. The self-aligning feature of this bearing and the fact that it runs submerged in a bath of water-cooled oil, materially reduce the attention required by the thrust bearing, the only requirement being the periodic filling of the thrust casing with oil.

Some of the principal advantages claimed for this type of pump by the manufacturer are: Double the capacity of any other type of deep-well pump from a given size casing, excepting the air lift; three to six times the capacity of a two-plunger reciprocating pump of the same size of well; exceeds the capacity of a centrifugal pump by fifteen to seventy-five per cent.—*Power,* 19 June, 1923.

Combined Riveting and Welding.—In converting the battleship *Kearsarge* into a sea-going crane-ship with a lifting capacity of 250 tons the whole ship structure had to be materially reinforced in order to take care of the stresses imposed by the presence of the crane and the possible loads that might be placed on her decks. As pointed out in a full description of this crane-ship appearing in the June issue of *Mechanical Engineering,* the official organ of the American Society of Mechanical Engineers, it was even thought necessary to reinforce the riveted joints in some of the strength members by welding.

So the main deck, which is composed of three thicknesses of plating, was, in addition to its riveted connections, electrically butt welded throughout the top strake thus making that member practically one piece of metal. Likewise, it is stated that it was found difficult to select angle irons for connecting the strength bulkheads to the under side of the deck that would have sufficient metal left after the necessary rivet holes had been drilled. It was decided that this problem could be solved by welding the

toes of the double bounding angles to the bulkheads for the purpose of taking a large portion of the shear stress off the rivets.

The performance of this crane-ship will be watched with interest for many reasons. It is the only sea-going crane-ship and, at the same time, the largest floating crane in existence. It has already actually lifted 312 tons and may be called upon to lift an even greater weight. The size of the structure has called for a design that exceeds well tested limits. But has it in dealing with stresses of unprecedented magnitude solved the problem of the most efficient joint? Can the condition where there is not enough metal left in a plate, or enough plate and not enough rivets be solved by additional welding? Will a combination of riveting and welding work in unison or will the weld which unites the metal in one piece take the entire load and the elastic limit of the joint be reached before the rivets begin to work? If riveting can not be depended upon for such a connection why not make an entirely welded joint?—*Marine Engineering and Shipping Age*, July, 1923.

AERONAUTICS

U. S. Soon to Act on Pact Curbing Aerial Warfare.—Washington, June 23.—The United States Government is preparing to submit to the Senate a treaty with the other powers setting forth drastic regulations to curtail the horrors of the use of the airplane in time of war, is was learned today.

This proposed treaty constitutes the first step to apply in a comprehensive manner international rules of warfare to the use of aircraft in war.

A commission of famous jurists sitting at The Hague, in accordance with resolutions of the Washington Arms Conference, have completed this proposed agreement between the powers. John Bassett Moore, American international law authority and a judge on the World Court, was the United States representative at The Hague meeting.

As soon as preliminary arrangements have been made with the powers, President Harding, shortly after returning from his tour to the West and Alaska, is expected to submit a proposed treaty draft between the United States and the other powers to the Senate for approval.

The Hague agreement is between the same powers who participated in the Washington Conference. The proposed treaty would have as signatory parties principally the United States, Great Britain, France, Japan and Italy, and other nations would be asked to adhere to the pact later.

The text of the comprehensive rules to govern aircraft in time of war has been received here, and also is now being studied by all the powers party to the deliberations at The Hague.

The new rules outlaw bombing of civilian populations removed from the immediate scene of military operations, and a feature of the jurists' agreement is that the use of the airplane as a means of spreading propaganda during war is declared not to be an illegitimate means of warfare. Crews of such aircraft must not be deprived of their rights as prisoners of war. This is Article 21 of the Hague agreement.

Article 22 states that "aerial bombardment for the purpose of terrorizing the civilian population, of destroying or damaging private property not of a military character or of injuring non-combatants is prohibited." Article 23 outlaws "aerial bombardment for the purpose of enforcing compliance with requisitions in kind or payment of contributions in money."

"Aerial bombardment is legitimate only when directed at a military objective—that is to say, an object of which the destruction or injury would constitute a distinct military advantage to the belligerent," states Article 24.

"Such bombardment is legitimate only when directed exclusively at the following objectives: Military forces, military works, military establishment or depots, factories constituting important and well-known centers engaged in the manufacture of arms, ammunition or distinctively military supplies, lines of communication or transportation used for military purposes."

Then the rules outlaw the bombing of all communities not in the immediate neighborhood of the military operations, but state that the bombing of such communities near the scene of hostilities is legitimate "provided that there exists reasonable presumption that the military concentration is sufficiently important to justify such bombardment, having regard to the danger thus caused to the civilian population."—*Baltimore Sun*, 23 June, 1923.

Patrick Urges Large Air Force for U. S.—Kansas City, Mo., June 27. —Future safety of the United States may depend on the air service, Major-General Mason M. Patrick, chief of the United States Air Service, believes.

General Patrick recently paid a visit of inspection to the new flying field here. He is a member of the old school—forty-one years in the army.

"There have been just wars and there will be just wars. Let us be prepared for them," General Patrick declared. "The victories of future wars will be determined in the air," he continued.

"The work of the Air Service Department is hampered. My hands are tied by Congress. There seems to be a feeling that there will be no more war and that there is no need for development in the air.

"In answer let me refer to history. During the last 147 years there has been a definite need for our army in an active way on an average of once every eighteen months.

"The air service is the eyes of the Army. We don't want to go into battle like a blindfolded boxer.

"The second purpose of the air service is to combat the enemy. The air force of the United States is qualitatively equal to or superior to that of any other nation, but it is not large enough.

"Whether war may come from outside or from internal strife, it may be that some day we will have to hold up our heads and say 'You shall not!' to some one, and it is imperative that we be prepared.

"As to the commercial side of the development of the air service, we are on the eve of an era of extremely rapid transportation.

"The exploit of those two of my boys who recently spanned the continent in a day was not done to make records, which were incidental, but to test and better equipment, to demonstrate what can be done and to experiment in the field of long-distance flying."

As to the present air service, General Patrick said there are 880 officers and 8,500 enlisted men in the service—"an exceedingly small number in comparison with other nations."

A recent allotment of 1,700 additional men to the service will help out greatly, he said. He also told of the United States' superiority in the development of some of the air service.

"Metal planes are coming into greater use," he said. "With them we get speeds of from 160 to 170 miles an hour—ten to fifteen miles an hour faster than those of other countries."

An airport is essential to every community, he said, in connection with commercial development of the airplane.

General Patrick said that he did not believe the small, low-powered light plane, such as the one weighing less than 400 pounds used in a successful flight over the English Channel recently, has much of a place in army air equipment.

"In training its use is valuable," he said.

He also said an advanced type of plane designed by American engineers is supplanting the De Haviland models, which now are standard.—*Baltimore Sun,* 27 June, 1923.

Will Try to Prove Aircraft to be Superior to Big Battleships.—Washington, July 11.—Another series of bombing tests to prove to the world that a fighting airplane can blow the modern man o' war out of the water is being planned by Army air service officials today.

Dissatisfaction with the bombing tests last year off the Virginia Capes, which has left the superiority of the battleship and the airplane a moot question, is largely responsible for the decision to hold new tests.

Only Army airmen will participate. The only function of the Navy will be to maneuver the battleships *Virginia* and *New Jersey,* which the Army will ask the Navy to turn over under authority of an act of Congress. The tests are expected to be made in the latter part of August off the Virginia Capes, permitting the air service to use Langley Field as an operating base.

Plans also are being made to demonstrate the effectiveness of gas in connection with aerial bombing in the tests. It is possible that men will be aboard the ships when tests are made with tear gas, which would be allowed to permeate every aperture of the vessels.

While highly perfected gas masks would serve as perfect protection against the non-poisonous gases, officials fear that public opinion would oppose the presence of men aboard when tests with poison fumes are made. Many officers are said to be ready to take their chances with death, but it is probable that animals will be used.—*Baltimore Sun,* 11 July, 1923.

French Sky Hornets Worry Britain.—Four years, seven months, and sixteen days after the greatest and most disastrous war in history, according to the precise calculation of the Boston *Globe,* "England and France, two nations who were sworn to brotherhood by mutual baptism of blood and suffering, are arming, one against the other." France has built up the most formidable air force in the world, and Great Britain now announces that she is to build a large defensive air fleet. "Russia is not far behind," declares the Providence *Bulletin.* So the "vicious circle" of armament and counterarmament—in the air—continues. In fact, observes the Brooklyn *Eagle,* "Europe, with half a million more men under arms than there were in 1913, despite the compulsory reduction of 696,135 in the standing armies of Germany, Hungary and Bulgaria, seems to be back where it started in 1914." This, in the opinion of the Providence *News,* is nothing less than a reflection on the League of Nations. "England, with due reverence for the League as a force for world peace, places her first trust in a fighting air force equal to that of France," pointedly observes this paper.

The Washington Conference of 1921, we are reminded by the Louisville *Courier-Journal,* "did nothing regarding the limitation of air forces, even though the world was convinced that the next war would be fought in the air. And what avails reduction in battleship construction programs if such reduction be followed by an increase in the aircraft construction program?" Continues this paper:

"France's militaristic policy provokes Britain's program. It is not forgotten that France has not yet even ratified the Washington Treaty. Time that might have been passed in ratifying the pledge given by France's commissioners at Washington has been passed in strengthening France's military establishment, in projecting military expeditions into Germany and the Near East.

"For months France has been working feverishly to outbuild the rest of the world in aerial war craft. Of late its plans have looked to the control of the English Channel and the Mediterranean, the machines to have a flying radius of 1,000 miles. That England has been watching its next door neighbor is evidenced by the statement of Prime Minister Baldwin in the House of Commons that there would be an increase of thirty-four air squadrons, giving England a total force of fifty-two squadrons for home defense."

In his statement on the proposed expansion of the British Air Force, Prime Minister Baldwin said:

"In addition to meeting the essential air-power requirements of the Navy, Army, Indian and overseas commitments, British air power must include a home-defense air force of sufficient strength adequately to prepare us against attack by the strongest air force within striking distance of this country."

However, he added:

"In conformity with our obligation under the Covenant of the League of Nations, the British Government would gladly co-operate with other Governments in limiting the strength of air armaments on lines similar to the Treaty of Washington in the case of the Navy, and any such arrangement, it is needless to say, will govern the policy of air extension set out in this statement."

"This announcement marks the conclusion of the movement begun some months ago to have the British air force equal that of the French," says the London correspondent of the New York *Tribune*. According to figures obtained from reliable sources by Ladislas d'Orcy, editor of *Aviation* (New York), France has 1,562 first-line airplanes, against Great Britain's 408. The present British air personnel is said to be 29,306, and the French personnel 37,730. France denies that behind its huge air force there has ever been an offensive design against Great Britain. The chief purpose of the great size of France's aerial armada is said to be defense against Germany, or a combination of Germany and Russia. And this, according to Mr. d'Orcy, is no idle dream. In reply to those who aver that "Germany has been disarmed," he maintains that Germany is manufacturing "commercial" airplanes at the rate of 100 a month, with the ultimate view of putting them to military use.

France's position, briefly, is that in view of the failure of Great Britain and the United States to guarantee her against aggression, she is justified in maintaining the greatest air force in the world. France does not want to engage in a competition in airplane building with England, say Paris correspondents of New York papers, and would like to come to an agreement whereby the air forces of both Powers would be reduced. But France, we are told, will not agree to aerial limitation giving her the ratio which she received navally at the Washington Conference. At present she is supreme in the air, and the French argue that if air armaments are limited as naval armaments were, the race will halt right where it is, and reduction will be effected in proportion to existing strength. "If the Washington rule was good for battleships, let it apply now for airplanes," is the way the Paris correspondent of the New York *Times* states the argument for France.

England's attitude, briefly, is that her island position, invulnerable while the British Navy dominated the seas, is now open to air attack. British naval experts condemn the battleship as useless against aircraft, and declare that the vital factor in the next war will be the airplane. "The next war," says one of England's spokesmen, "could be begun and quickly ended by air force alone." Bombed night after night by Zeppelins during the war, Englishmen are now said to feel that the security of the country from air attacks is paramount to all other military considerations.

But American editors have not taken either French or British views at their face value; they have not, as it were, "swallowed them whole." "Possibly Prime Minister Baldwin's move is only a preliminary to negotiation with France and other Powers for a limitation of air armament," suggests the New York *Tribune,* while *The World* hints that France intends to use her aerial forces to obtain diplomatic prestige. In the opinion of the Newark *News:*

"It must be remembered that Mr. Baldwin's shot out of the blue came in the midst of the present deadlock over the Ruhr and reparations question. There is a strong possibility that it is merely a jolt intended to counteract French extremists. The major question at issue still remains that of the Ruhr and reparations. The injection of the air program issue into the debate, for the time being, at least, is probably intended to react on the major issue rather than on actual air armaments."

As the Charleston *News and Courier* observes:

"It is reasonable to assume that the French policy in the Ruhr is as much responsible for the British Government's decision as is the great fleet of French airplanes itself. British suspicion that the French really intend to stay in the Ruhr seems to be ripening into conviction, and with France permanently controlling that great iron-producing district, the richest in Europe, she becomes a mighty military nation indeed. In the circumstances there is nothing for Britain to do except make herself strong enough to deal with any danger that may come from across the Channel. Her old isolation is gone."

"This is the kind of preparedness that has teeth in it," admits the Milwaukee *Sentinel.* And it goes on to ask:

"Will the course of events between England and France parallel the history of the relations between England and Germany? The war between England and Germany began long before 1914. It practically began in 1895, when the German Emperor hurled his big Navy challenge across the North Sea. After that, there was no peace, no matter how much the diplomats and the Hague conferences might talk about peace."

The Philadelphia *Record,* however, does not expect hostilities between France and England in the near or the remote future. But, it reminds us—

"There is no question about the bitter feeling in France because England objects to the Ruhr adventure. And France has objected to the British opposition to Franco-Turkish policies, but in this matter England has yielded a great deal, and France has resisted Turkish demands.

"France is indignant that England would not join in the invasion of Germany. In spite of repeated statements that passive resistance in the Ruhr is weakening, it is maintained sufficiently to drive France to more aggressive actions, and these increase the danger to the peace of Europe.

"France protests that it is not belligerent, and that it wants nothing from Germany except its share of 132 billion gold marks. But Germany is disarmed. Is it necessary for France to maintain the largest army outside of Russia and an incredible number of military airplanes in order to protect itself against Germany?"

It is estimated that a thousand warplanes can be built for the price of a single post-Jutland battleship, and this fact in itself indicates to the New York *Herald* a new danger. Says this paper:

"In one respect the present contest for air supremacy is more serious than the former contest for naval supremacy. The high cost of battleships reduced the number of naval contestants; none but great Powers could afford powerful fleets. But airplanes are cheap and the small industrial Powers of Europe are quite equal to building and maintaining large numbers of them. Indeed, even a limited number of airplanes of advanced design would give a small State enormously more military power

than it formerly possessed, at less cost, and might well make it a troublesome and dangerous neighbor."

The only way out of the present hate-breeding armament race, as the Philadelphia *Public Ledger* sees it, is another Washington Conference, "to deal with the snakes of the sea and the hornets of the sky." Surely, thinks *The Ledger*—

"There ought to be wisdom enough in the world to bring about an aerial holiday. If not, then the half, or wholly, bankrupt Old World Powers are off in another and new armament race, and no man living may say what the ending of that race will be."

PRESENT AIR STRENGTH OF GREAT POWERS

From an article by Ladislas d'Orcy in "Aviation" (New York, July 16)

Country	*First Line Airplanes*	*Airplane Squadrons*	*Personnel*
France	1,562	174	37,730
United States	630	48	14,466
Great Britain	408	34	29,306
Italy	370	37	8,000*
Japan	330	33	5,000*

*Estimated.

AUTHORIZED AND CONTEMPLATED AIR STRENGTH OF GREAT POWERS

Country	*First Line Airplanes*		*Airplane Squadrons*	
	1924	*1925*	*1924*	*1925*
France	1,800	2,000	200	220
United States	?	?	?	?
Great Britain	600	1,000	50	84
Japan	?	?	?	?
Italy	720	?	60*	?

*Estimated. The number of airplanes per squadron is given by this authority as follows: United States Army, 12; Navy, 18; Marine Corps, 12; Italy, 10; British Royal Air Force, 12; Japan, 10, and France, 9.

LOCATION OF AIR SQUADRONS OF GREAT POWERS

From an article by Ladislas d'Orcy in "Aviation" (New York, July 16)

Country	*Home*	*Overseas*	*With Fleets*	*Total*
France	131	39	4	174
United States	25	14	9	48
Great Britain	7	23	4	34
Italy	34	3	0	37
Japan	27	3	3	33

Note.—"Home" for France includes continental France and Corsica; "Overseas" includes all other possessions.

"Home" for United States includes the States and Territories within the continental limits of North America; "Overseas" includes all other possessions.

"Home" for Great Britain includes England and Scotland, no British air forces being stationed in Ireland; "Overseas includes all other possessions exclusive of the self-governing Dominions.

"Home" for Italy includes continental Italy, Sicily and Sardinia with adjacent islands; "Overseas" includes Tripoli, Cyrenaica, Erythræa and Italian Somaliland.

"Home" for Japan includes the Japanese Islands proper, with adjacent islands; "Overseas" includes Formosa and Korea.

—*Literary Digest*, 14 July, 1923.

The New Naval Dirigibles.—The giant Navy dirigible, the *ZR-1*, which is to be fleet airship No. 1 of the flight squadron contemplated for construction in the future if practical experience proves such a development desirable, is nearing completion at the naval airship station at Lakehurst, N. J., the largest airship hangar in the world. The parts for this huge rigid airship were made in Philadelphia and assembled at Lakehurst, the work being about ninety-nine per cent completed at the present time. Tests have already begun on parts of the ship to see that the vertical and horizontal rudders and their controls are absolutely perfect, and this work of testing various parts will continue until the dirigible is completed and approved. Within three weeks the permanent ground crew, consisting of nearly 200 enlisted men, will be picked and sent to Lakehurst and initiated into their duties of caring for the *ZR-1*. The reserve supply of helium gas is now being brought to Lakehurst to be used if for any reason a larger amount is necessary than has already been received. Enough helium to inflate the twenty large gas cells which will raise the frame, the engines, supplies, materials of war, and a crew of about thirty men has already been received, and everything is in readiness for flights as soon as the tests prove it to be safe. Helium gas is a non-inflammable gas, with nearly as much lifting power as hydrogen and with the advantage that nothing can cause it to burst into flames and destroy the ship and the crew. Thus accidents are reduced to a minimum. Helium is found, in large quantities, only in the United States.

Beginning next month, and continuing for three or four weeks, shed tests will be made on the *ZR-1*. These are made under as near actual flight conditions as can be secured with the airship securely fastened in its hangar. The members of the crew are kept in their places at their duties, the engines are run at the required speeds, and the endurance of the engines is tested by making them run for the length of time which might be called for in actual flight. These tests also include running the engines with the nose of the airship up or down or the controls arranged in any way which might be required by conditions in flying. When it is absolutely certain that the airship is perfect in every detail, the christening will take place at Lakehurst, and the first great airship of the fleet will be launched. Then will begin flight tests under all sorts of conditions, lasting well into the fall. These will include flights over all the principal cities of the east, at least, and possibly a cross-country hop. No polar or around-the-world flight can be attempted this year, for the work of testing the dirigible will not be completed in time. Naval officials are contemplating the possibility of some such flights next year, however.

The purpose of the *ZR-1* and the other airships which may later be ordered is for use with battle fleet squadrons in their maneuvers, as long-distance scouts, as "eyes" for directing gun fire while hovering over a given spot for long periods of time and when far removed from the coast and available bases, and as load carriers and bomb carriers. The airship *ZR-1* embraces the most improved factors in design known to aeronautical science and is expected to be invaluable for long-distance and sustained flights when such are demanded. It is valuable where an airship is needed for operation at a great distance from its base, as it can carry large amounts of supplies and can remain in the air for a long time. The opposite is true of attack planes, which must remain near their base and

dash out only for short distances. The enormous size of the *ZR-1* is shown by its dimensions. It is 680 feet long, has a diameter of 79 feet, and a gas capacity of 2,115,000 cubic feet. It will be driven by six 300-horsepower Packard engines with a maximum speed of seventy-five miles per hour and a cruising speed of sixty-five miles per hour. The crew will consist of about thirty men.

The *ZR-3*, now being constructed by the Germans in Germany as a part payment of reparations due the United States and awarded to this country by the allied council of ambassadors, is a commercial plane and will be of no use in time of war as a bomb dropper or battleship. It was given to this country for commercial purposes and was turned over to the Navy by the United States Government, since the Navy bureau of aeronautics was given charge of the development of rigid airships by joint agreement between the Army and Navy and has the facilities for handling such machines. The *ZR-3* will be finished some time this fall and after the tests are completed will be flown to this country by a German crew, carrying Captain G. W. Steele, U. S. Navy, as an observer. The latter will sail for Germany very soon to be on hand when the final tests are made. The *ZR-3* is 660 feet long, 92 feet in diameter, and has a gas capacity of 2,400,000 cubic feet. It will probably be inflated with helium also.—*Army and Navy Register*, 14 July, 1923.

Vibration the Cause of Failure More Than Any Other.—Newport, R. I., July 13.—Why, in the present state of development of aviation, should there continue to be so many motor failures, even when the best of care has been exercised in preparing the airplanes for flight? This question is being asked frequently of late, especially when a flyer of Lieutenant Maughan's skill and experience is forced to abandon a record-breaking flight on account of motor failure. The "let-downs" of the aviator are being compared unfavorably these days with the steady progress of the automobile tourist. What is the answer? The direct causes of forced landings in the past have been almost as numerous as the forced landings themselves, and a majority of them are concerned with motor failure. Eliminating consideration of experimental designs and such causes as insufficient supply of gas or oil and other products of carelessness, inefficiency, inexperience or act of God, the record is still far from satisfactory to the flyers or to their friends looking up, and again we return to the question, "Why?"

No one cause can be brought forward as being responsible for every motor failure of this class, but there is one that produces more than any other, perhaps more than all the others combined; and that is vibration.

The factors that produce vibration in airplanes will not be discussed. The structure of the airplane, as well as the motor, contributes its share and vibration always exists to a greater or less degree in all present-day designs. Often breakages in some part of the motor itself can be traced directly to this cause; however, most failures are not due to any fault in the motor proper, but rather in some other part of the power plant. Gasoline, oil, water, perhaps air under pressure, all necessary for operating, have to be conducted through pipe lines and valves. Unknown to the pilot a leak is started by vibration; the supply of the essential fluid is soon exhausted; another forced landing is recorded.

After long service with any good design of power plant installation most of the defects are gradually corrected and failures of this sort become infrequent. But in comparatively new designs that have not been subjected to the wear and tear of long service—and probably most of the record making airplanes of today are in this category—it is not to be expected that all the "bugs" have been worked out. An important member has not failed to date; the metal of that member, however, has become

"fatigued," a fact that cannot be determined by inspection; on the next flight it lets go. The defective part is replaced by one of heavier material and if possible, the vibration at that point is eliminated or reduced. Thereafter the power plant gives perfect service—until some other part lets go.

Why not then make every feature of the motor and its accessories heavy enough to withstand the fatigue of any amount of probable vibration? That would be an excellent idea except for the fact that the motor would never fly in a plane. This principle is followed to a certain extent in airship power plants, and they are far more reliable; the airship has an enormous reserve of lifting capacity. It is followed to a greater extent still in the automobile motor, but the automobile does not fly. This is not the only reason for the superior staying power of the automobile motor, but it is an important one.

How can vibration be eliminated? That is a question for others more expert in aeronautical and automotive engineering to answer if they can. It is one of the many problems that they are continuously attacking. Great advances have been made in this particular since the armistice was signed, as much or more than during the war, but there is still a great deal to learn. Let us hope that progress will continue as rapidly in the future, until the airplane motor's worst enemy—vibration—is reduced to a state of subjection.—Commander Albert C. Read, U. S. N., in *Boston Transcript,* 13 July, 1923.

New Kind of Helicopter.—Mineola, July 13.—The Vertipactor, a heavier than air flying machine, serving the same purpose as the Helicopter, will be tested Monday at Curtiss Field. The machine is said by its inventors, John H. Lynch of Pawtucket, R. I., and Iver Carlson of Chicago, to have risen six feet from the ground and to have remained aloft fifteen minutes on a trial flight.

It is twelve feet high, twelve feet wide, and has a fifteen foot U-shaped tunnel of wood, aluminum and canvas, the length of the machine, under which air is sucked by two propellers worked by two 200-horsepower motors, to push the apparatus up in perpendicular flight. The pilot sits in a box-like fuselage between the motors.

The two propellers, it was stated, work in opposite directions to lift the machine, but together for straightaway flight.—*Boston Transcript,* 12 July, 1923.

Helicopter Hovers Nine Minutes.—The helicopter of Etienne Oehmichen in its latest trials is reported to have lifted three persons to a height of five meters. The machine also twice rose with the same number of passengers to heights of three to five meters.

The Oehmichen helicopter has been making records steadily since its construction. It now has to its credit a total of two hours in flight, with one flight of nine minutes. It also accomplished a horizontal flight of 400 meters.

After the engine, which was worn out, is changed, the inventor will attempt a kilometer flight in a closed circuit which is one of the trials prescribed by the French air department for purchase of the machine.
—*Aviation,* 2 July, 1923.

Airplane Tour Around the World.—Approval has been given by the Secretary of War to a project of the air service to map an air route for a tour around the world. First Lieutenant Clarence Crumrine, now at McCook Field, Ohio, and First Lieutenant Clifford Nutt, now on duty in the Philippines, are the two officers of the air service that have been selected to engage in the preliminary work. They will study at the outset

available landing places on the Alaskan coast, Aleutian Islands, Japan, and Australia. The preliminary plans contemplate that in Australia the flight would take the course followed by the British aviators in their flight to that country from England some time ago. For the time being, however, the around-the-world flight merely is a tentative project, and whether or not it shall be attempted will be decided only after consideration of the reports of the preliminary survey and of the many other factors that will be involved.—*Army and Navy Register,* 30 June, 1923.

The President Inspects the "Langley."—At the Washington Navy Yard, President Harding, members of the Cabinet and prominent naval officers inspected the *Langley,* the navy's sole aircraft carrier. The party was transported in the great airplane elevators from one deck to the other, and the President inspected with much interest the "fiddle strings" landing gear used to halt the airplanes when alighting on the upper deck. As a result of his visit, Mr. Harding is said to be more strongly than ever in favor of converting some of the Navy's battle cruisers into aircraft carriers.—*Time,* 25 June, 1923.

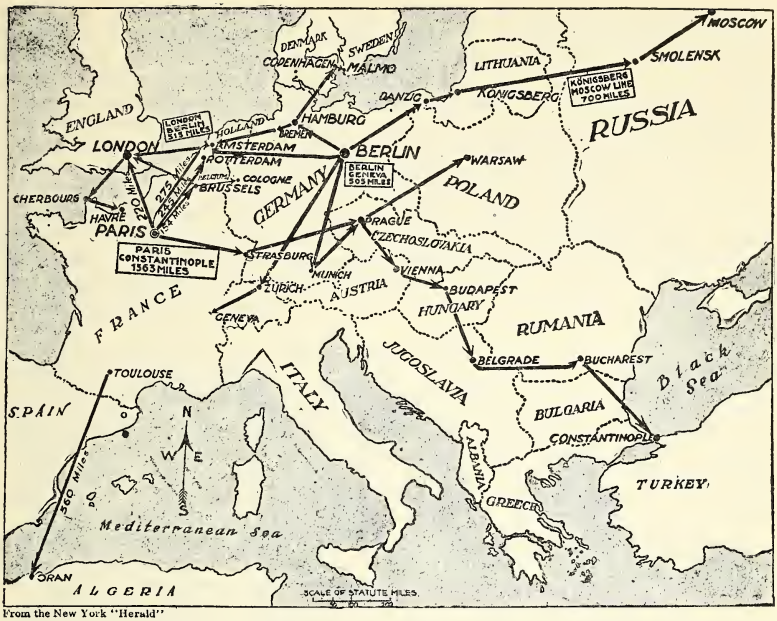
Largest of Airships to Fly Across Ocean.—Washington, June 26.—The largest airship in the world, a Zeppelin, now being built in Germany, will be flown across the Atlantic this fall or next spring, and delivered as a prize of war to the United States. The complete plans of this Leviathan of the air were learned officially today.

According to reports of the Navy Department here, which will receive the Zeppelin, the ship is about fifty per cent completed, but the Ruhr occupation is said to be causing some delay.

It was provided in the peace treaty that the Allies and the United States were to receive a certain number of airships and airplanes.—*Baltimore Sun,* 26 June, 1923.

Dirigibles Ready in August.—Washington, June 25.—Two new Navy dirigibles, the *ZR-1* and *ZR-3* are expected by the department to be ready for their first distance flights in August. The *ZR-1* building at Lakehurst, N. J., is to have her first "shed" trials during July and soon afterward will try this cross-country flying at about the time the *ZR-3,* under construction in Germany, starts on her delivery flight across the Atlantic.—*Boston Transcript,* 25 June, 1923.

Aeronautic Engine Testing Laboratory.—A contract was awarded by the bureau of docks of the Navy Department on June 27 for the project of transferring the naval aeronautic engine testing laboratory from the Washington yard to the naval aircraft factory, Philadelphia. The plant to be installed will be modeled after the latest scientific testing arrangements. It will include dynamometer stands with appliances for absorbing or utilizing the energy developed by the motors undergoing reliability tests, together with air-conditioning apparatus and all necessary technical and shop facilities. It will be possible to run engines under conditions simulating heights up to five miles above ground. For this purpose it will not be necessary to spend money on the construction and operation of elaborate vacuum chambers around each stand, recent developments having shown that correct altitude effects can be produced more conveniently and cheaply by the provision of proper air-supply and cooling-water controls. The contract was awarded to the Newport Contracting and Engineering Company, Inc., of Newport News, at $82,145.—*Army and Navy Register,* 30 June, 1923.



From the New York "Herald"

NETWORK OF COMMERCIAL AIR LINES COVERING EUROPE

Nearly 36,000 passengers and 800 tons of merchandise and mail used these routes last year

TITANIC BRITISH AEROPLANES.—In addition to the many spectacular displays which wil be staged at the Royal Air Force Pageant at Hendon on June 30 will be shown some of the latest "Hush Hush" Air Ministry machines. These include the *Avro-Napier,* the only machine in the world fitted with a 1,000 h.p. engine; the *Vickers-Napier Victoria,* a huge troop-carrying aeroplane which is capable of conveying twenty-four men with complete equipment; the *Boulton* and *Paul Napier,* one of the newest all-steel bombing aeroplanes; and the *Blackburn-Napier,* a torpedo-carrying machine for use with the Navy. All these machines will give exhibition flights during the afternoon and will convey some idea of the extent of progress made in British aeroplane design.—*Army, Navy, and Air Force Gazette,* 16 June, 1923.

NEW AEROLOGICAL PLOTTING BOARD.—A new aerological plotting board for use in obtaining the winds aloft by means of pilot balloons has been designed by the Bureau of Aeronautics, and proposals on the construction of a trial model are about to be requested. The board combines the best feature of boards which have previously been used in the Navy with the addition of several good points from plotting boards in use by other aerological organizations. It eliminates several of the objections to boards previously in use. If the trial board proves as satisfactory in operation as anticipated, it will be adopted as the standard for Naval aerological observatories.—*Aviation,* 18 June, 1923.

New British Aircraft Carrier.—According to an Associated Press dispatch from London, the British Admiralty has laid down a new type of aircraft carrier which has two decks connected by huge lifts. The upper is the airdrome deck, and the lower is equipped with workshops for carrying out repairs. There are also supplies of necessary spare parts, ranging from a propeller to a complete engine, all ready for instant use. The flying deck is fitted with a search-light and landing-light tower, which make it possible for a machine to land at night. There are also cranes for hoisting on board flying boats which need repair.

It is now possible for the fastest machines to land with safety on the deck of an airplane carrier. An arrangement of nets brings the airplane to a standstill without danger, and a machine which attains a speed of three miles a minute can land in a distance of not more than forty feet.

—*Aviation*, 2 July, 1923.

Bolts From the Blue.—Torpedo-planes have had another chance of showing what they can do against battleships. A squadron of machines from the Chickerell Aerodrome descended on the Atlantic Fleet as it lay at anchor in Weymouth Bay and launched dummy torpedoes at the largest ships, hits being claimed on the flagship *Queen Elizabeth* and the *Valiant*. It appears that timely warning of the attack reached the fleet, and so many guns were trained on the intruders that they would have had to pass through a terrific barrage of shell had it been "the real thing."

Experiments of this nature may lack realism, but they are excellent training both for the airmen and the anti-aircraft gunners in the ships, and it is a pity they do not take place more often, preferably at sea. A day will probably come when we shall have crewless aeroplanes, maneuvering under wireless control. When that happens it will be possible to determine more clearly what chance hostile torpedo-planes have of getting within range of a hostile fleet, for the latter will then be able to use live shell against the machines.

According to the general opinion of the service, the torpedo-plane in its present stage of development represents no serious menace to well-armed ships under way, though it might be used with deadly effect against vessels at anchor, especially if the attack came with little or no warning.

—*Naval and Military Record*, 27 June, 1923.

Plane Refueled in Flight.—An airplane in flight was refueled for the first time in the history of aviation near San Diego, Cal., on June 25.

Flying at a speed of 90 m.p.h. Lieutenants Hines and Seifert guided their craft above that flown by Captain Lowell Smith and Lieutenant John P. Richter, ran down a forty-foot steel wire encased rubber hose and within two minutes the feat was done.

The four officers many times in practice had succeeded in getting the pipe from one plane to another, but never before had the gasoline been sent through. A few drops scattered over the hot exhaust pipes would have spelled disaster for at least one of the planes. Finally the officers regarded themselves as "letter perfect" and ready for the hazardous attempt.

The tryout was in preparation for an attempt of Captain Smith and Lieutenant Richter to smash all records for endurance. They plan to go up and remain aloft four days and nights which they will only be able to achieve by refueling in the air. For this purpose from eight to twelve contacts will have to be made in flight.

Preliminary refueling tests developed one fault that was remedied quickly. That was the inability of the fueling plane pilots to haul the hose back into the fuselage. The rush of wind under the plane caused

the heavy hose to whip around like a piece of string. It required expert piloting on the part of the pilots to get the two planes, thirty-five feet from wing tip to tip, together, and then throttle down so that the hose could be caught and fastened to the tank.

In the preliminary tests Seifert was compelled to make a landing with the forty-feet hose dangling under his machine. It was found that by enlarging the hole in the bottom of the fuselage of the fueling ship it could be hauled aboard more easily.—*Aviation*, 9 July, 1923.

THIRTEEN WORLD'S RECORDS ESTABLISHED BY NAVAL PILOTS AT SAN DIEGO.—The following dispatch received in the Bureau of Aeronautics on June 9, tells of thirteen world's records established by Naval pilots at the Naval Air Station, San Diego, Cal.:

Following official records made by Aircraft Squadrons Battle Fleet on June 6-7. World's records broken: Distance and duration, Lieutenant (j. g.) M. A. Schur in *DT-2* plane, time 10 hours, 31 minutes, 11 seconds, distance 1,175 kilometers.

World's records established: Lieutenant (j. g.) M. A. Schur in *DT-2* plane, speed for one thousand kilometers, time 8 hours, 51 minutes, 2 seconds, speed 70.2 miles per hour.

Lieutenant R. L. Fuller in *DT-2* plane, duration and distance with 1,000 kilograms weight, time 2 hours, 45 minutes, 9 seconds, distance 325 kilometers.

Lieutenant H. E. Halland in *F-5-L* plane duration and distance with 500 kilograms weight, time 7 hours, 35 minutes, 54 3-5 seconds, distance 750 kilometers.

Lieutenant E. B. Brix in *DT-2* plane, speed for 500 kilometers, time 3 hours, 57 minutes, 48 2-5 seconds.

Lieutenant H. T. Stanley in *F-5-L* plane, duration and distance with 250 kilograms weight, distance 925 kilometers, time 10 hours, 6 minutes, 53 seconds.

Boatswain E. E. Reber, *DT-2* plane, speed over 3 kilometers, 102.88 miles per hour.

Lieutenant E. B. Brix in *DT-2* plane, altitude with 250 kilograms weight, 12,050 feet.

Lieutenant H. E. Halland in *F-5-L* plane, altitude with 2,000 kilograms weight, 5,200 feet.

Ensign E. E. Dolecek in *F-5-L* plane, altitude with 500 and 1,000 kilograms weight, 8,600 feet.

Lieutenant H. T. Stanley in *F-5-L* plane, altitude with 1,500 kilograms weight, 7,600 feet.

Lieutenant C. F. Harper in *DT-2* plane, altitude with no useful load, 15,100 feet.

Lieutenant R. A. Ofsie in *TS* plane, altitude with no useful load, 18,400 feet.—*U. S. Air Service*, July, 1923.

WORLD'S RECORDS BROKEN.—Seventeen world's records for seaplanes, most of them in new events, were established at San Diego, Cal., by naval fliers on June 6-7, when the tests were concluded.

Lieutenant H. E. Halland, piloting an *F-5-L* plane lifted a recognized load of 2,000 kg. to a height of 5,200 ft. Lieutenant Ralph Ofstie, in a single-seater *T-5* plane, rose to a height of 18,400 ft, where he encountered a temperature of 2 deg. below zero. The atmosphere was so rarified that the air in the pontoons of the machine was sucked out and when the plane began to descend the exterior pressure caved in the pontoons. Lieutenant Earl Brix, ascending in a torpedo plane to 12,505 ft, carried a recognized load of 250 kg. and thus made a record. Several other naval aviators made remarkable altitude flights in planes carrying heavy weights.

The only speed test of the day, flown in competition, was won by Boatswain E. E. Reber, who piloting a torpedo plane with a 400 h.p. Liberty motor, made an average time of 102.88 m.p.h. for three different laps.

In an attempt to break his own record for endurance in a single motored seaplane, Lieutenant M. A. Schur, U. S. N., established a new world record for endurance at San Diego, Cal., on June 13. The endurance flight was made in a standard type of Navy torpedo plane, the *DT-2*. The record established was for 11 hr. 16 min. 59 3-5 sec. over a distance of 1,275 kilometers.—*Aviation*, 25 June, 1923.

Training for Airplane Races.—The Naval Air Station at Anacostia will soon take on the appearance of a training camp when training begins for the Schneider Cup Race to be held in England, September 28, and for the Pulitzer Race.

The following pilots have been selected to represent the Navy in these races: Schneider Cup Race: Lieutenant A. W. Gorton, Lieutenant Rutledge Irvine, and Lieutenant David Rittenhouse. Lieutenant F. W. Weed will go to England with the above team and will be in charge of all arrangements for the Navy's participation in the races. Training for the Schneider Cup Race will be in fast types of service seaplanes. Shortly before the team is to leave for abroad, the pilots who are entered in the race will go to Philadelphia where they will try out the seaplanes which are to be taken abroad for the race. The team and planes will leave this country for England, August 20, in order to afford ample opportunity for the pilots to accustom themselves to the conditions over the course.

While the Schneider Cup team is training at Anacostia, Lieutenants H. J. Brow and L. H. Sanderson, U. S. M. C. and Ensign A. J. Williams will be training for the Pulitzer contest. These officers, who all had experience in the race at Detroit last year, are expected to carry the Navy standard to victory in St. Louis.—*Aviation*, 25 June, 1923.

Fleet Air Forces Distributed.—Washington, July 13.—Distribution of air squadrons attached to the battle fleet to points along the Pacific Coast and in Hawaii for summer practice has been ordered by the Navy Department with a view to enabling the units to acquaint themselves thoroughly with the topography of those areas while the fleet is idle. Twelve observation planes will go to Mare Island and twelve fighting planes to Sandy Point, Wash., all flying to their new stations from San Diego. Six torpedo planes, six fighting planes and six observation planes will be shipped on naval auxiliaries to Hawaii for a six weeks' stay.—*Boston Transcript*, 13 July, 1923.

Air Mail.—The Navy now has its own aerial mail service between Washington and Hampton Roads. A new *DT-4* plane started last week, making a daily trip down the river. Not only does this provide a rapid transit for all official communications from the department to the Hampton Roads base and to the Norfolk Navy Yard, but it will provide a practical endurance test for the Wright T-2 engine with which the plane is equipped. It is desired to determine just what its merits are and to eliminate the "bugs" as speedily as possible.—*Our Navy*, 1 July, 1923.

Panama Canal Air Defenses.—In last week's conference with newspaper correspondents, the Secretary of War stated that he had visited all the public works in Porto Rico, Panama and on the Pacific Coast as far north as San Francisco.

With reference to the question of the defenses of the Panama Canal, he does not desire to make a definite statement at present. He has some

ideas on the subject, but prefers that the question be passed on by the Joint Board and the General Board. That in a general way it seems that there should be additional anti-aircraft defenses in Panama, additions to flying fields and installation of 16-in. guns.—*Aviation,* 18 June, 1923.

Largest Aeroplane to be Launched in America This Month.—Dayton, Ohio (by mail).—The largest aeroplane the world has known, with a wing-spread of 120 feet, will take to the air for the first time some time this month.

The new monster of the skies, intended solely for use as a bomber, and said to be capable of carrying a quantity of explosives sufficient to destroy a large portion of a modern city, is being assembled at McCook Field, the Army Air Station, under the direction of Mr. Walter H. Barling, its designer.

With its great width and other measurements in proportion, the aeroplane will dwarf the largest machines now used. The height of the new aeroplane will be 28 feet, while its length from nose to tail will be 65 feet. Driven by six Liberty engines, the new machine will require a minimum crew of four men, and contain provisions for a working force of eight men, to be used when the occasion requires. Exclusive of the crew, it will weigh more than 40,000 pounds.

With the idea of obtaining a maximum of lifting power, stability, and safety, Mr. Barling designed the ship as a triplane of modified type. The upper and lower wings will be of practically the same dimensions, while that of the center will be narrower. Along its length will run the control devices, giving them protection and adding a feature of safety.

Describing the value of the new plane as a machine of war, Mr. Barling, who during the war did much experimental work for the British Royal Flying Corps, says that its maximum load of several tons of explosives could do untold damage. One bomb of the size the ship can carry would be capable of sinking the largest and newest type of naval vessel, he believes. Likewise, a single bomb from the machine, he declares, could demoralize an entire community. Should such a projectile be dropped in the center of a city, he says, a fifty-foot crater would be dug, all buildings in the vicinity completely destroyed, and structures for a half-mile or more around would be greatly damaged.

The plane will have no passenger-carrying facilities, and its value would rest entirely in its ability to transport large projectiles great distances.—*Reuter.*

Results of the National Balloon Race.—The Fourteenth National Balloon Race, conducted under the auspices of the Indianapolis Chamber of Commerce with the sanction of the National Aeronautic Association, which was started July 4 from the Indianapolis Motor Speedway, was apparently won by the Army balloon *S6,* Lieutenant R. Olmstead, pilot, and Lieutenant J. W. Shoptaw, aide, who landed at Marilla, N. Y., approximately 500 miles from the starting place. Second place will probably go to the balloon *St. Louis,* H. E. Honeywell, pilot, and P. J. McCullough, aide, who covered 450 miles, landing at Brockton, N. Y. The third place has not yet been determined as three entries covered an approximate distance of 400 miles each, all of whom landed in Pennsylvania.

Several contestants experienced trouble from leaky gas bags and other causes. Roy F. Donaldson had to make a forced landing near Bryan, Ohio, after he discovered that his rip panel did not function. The pilot and his aide jumped from the balloon, when it touched ground and were slightly injured, while the gas bag escaped with their entire outfit, clothing, instruments, and food.

Wade T. Van Orman and H. V. Thaden, in the *City of Akron,* were forced down by a leaky gas bag only seventy-five miles from the starting place, while Ralph Upson and C. G. Andrus, made a parachute landing near Wapakoneta, Ohio, after the fabric of their balloon, the *Detroit,* had accidentally ripped.

Warren Rasor, withdrew from the race owing to a leaky bag, but took off after the other balloons, and landed near Arcadia, Ind., twenty-five miles from Indianapolis.

Following are the preliminary results of the race, with the order of start of the contestants and their landing places:

1. *Army S6.* Lt. R. Olmstead, pilot; Lt. J. W. Shoptaw, aide. Landed Marilla, N. Y. 500 miles.
2. *City of Akron.* W. T. Van Orman, pilot; H. V. Thaden, aide Landed 5 miles N. of Hartford City, Ind.; 75 miles.
3. *St. Louis.* H. E. Honeywell, pilot; P. J. McCullough, aide. Landed Brockton, N. Y.; 450 miles.
4. *American Legionnaire.* Capt. C. E. McCullough, pilot; Lt. C. R. Bond, aide. Landed Frankfort Springs, Pa.; 400 miles.
5. *Navy A6700.* Lt. L. J. Lawrence, pilot; Lt. F. W. Reichelderfer, aide. Landed Glenn Campbell, Pa.; 400 miles.
6. *Goodyear II.* J. A. Boettner, pilot; J. M. Yolton, aide. Landed Freemont, Ohio; 250 miles.
7. *Detroit.* Ralph Upson, pilot; C. G. Andrus, aide. Landed near Wapakoneta, Ohio, 2 A. M. July 5; 150 miles.
8. *Navy A6698.* Lt. L. J. Roth, pilot; Lt. T. B. Null, aide. Landed in Lake Erie. Balloon without basket or crew found floating 25 miles S.S.E. of Port Stanley, Ont.
9. *Navy A6074.* Lt. Comdr. J. P. Norfleet, pilot; Lt. J. B. Anderson, aide. Landed Mount Eaton, Ohio; 300 miles.
10. *City of Springfield.* Roy F. Donaldson, pilot; P. A. Erlach, aide. Landed 8 miles N.E. of Bryan, Ohio; 169 miles.
11. *Army S5.* Capt. L. T. Miller, pilot; Lt. C. M. Brown, aide. Landed Ford City, Pa.; 400 miles.
12. *Navy A6699.* Lt. F. B. Culbert, pilot; Lt. T. D. Quinn, aide. Landed Alliance, Ohio; 310 miles.
13. *Army S7.* Lt. J. B. Jordan, pilot; M. F. Moyer, aide. Landed Macedonia, Ohio; 150 miles.

The crew of the Navy entry *A6698,* Lieutenant L. J. Roth, pilot and Lieutenant T. B. Null, aide, has not yet been acounted for at the time of going to press, and it is feared that they may have been lost in Lake Erie. The balloon, without the basket, was picked up floating by a tug twenty-five miles S.S.E. of Port Stanley, Ont., and towed to the latter place. In the netting of the bag there were the uniforms of the crew together with food, charts and the log book. As the supporting ropes of the basket were found cut, the assumption is that the aeronauts cut loose from the gas bag on being forced down to Lake Erie. The appendix of the bag was also found slashed about six inches from the end, done with an apparent endeavor to let the gas out as the bag struck the water. Officers at the naval air station, Lakehurst, N. J., to which the two naval fliers were attached, hope that inasmuch as the baskets of the Navy balloons are almost unsinkable, the two men may yet turn up.

All of the balloons' baskets were equipped with life preservers about the basket, it is said. These preservers are lashed to the outside of the basket and would not have been cut off to lighten the balloon except in a very dire emergency over land, and certainly not by men who knew they were approaching water.

The baskets, of very light wicker construction, are lined with canvas, which under ordinary circumstances would hold out water. It was added that even if the basket leaked the preserver, filled with a material called "kapoc" instead of cork, would support the basket and its occupants. The canvas lining of the basket is provided with pockets. It was explained that the clothing found in the rigging of the wrecked envelope may have been placed there by the aviators before the approach of danger in an effort to cool off. It is customary when flying at low altitude to lessen the closeness of the basket quarters by doffing the flying suits.

Two *DH4's* and a *Loening* Air Yacht of the Army Air Service, from Selfridge Field, and the flying boats *Niña* and *Buckeye* of the Aeromarine Airways together with numbers of motor boats and revenue cutters made a concerted search of Lake Erie as soon as the Navy balloon was picked up.

The *Niña* piloted by C. E. Schiller and carrying P. E. Easter, Cleveland manager of the company and C. Richards as observers took a northwest course sighting the Canadian shore about ten miles west of Point Alma, an hour after starting. Striking the shore in a zigzag course, about ten miles off shore, the crew scanned the shore and lake through powerful glasses to Port Stanley, Ont., approximately fifty miles, without a trace of the missing lieutenants or the balloon basket. The *Niña* landed at Port Stanley and further examination of the balloon bag disclosed that several of the ropes that held the basket to the bag showed evidence of having been torn loose, only about half of the ropes showing clean cuts. Mr. Easter said some of the ropes showed evidence of having broken under terrific strain.

After a short stay the *Niña* left Port Stanley, flying in an easterly-southerly direction for a search of the American shore and the center of the lake. The American shore was sighted east of Conneaut, Ohio, and a zigzag course about ten miles off shore followed to Cleveland, about fifty miles, without a trace of the missing pilots or the basket.

Finally, on July 9, a fishing boat found the missing basket with the body of Lieutenant Roth strapped to it, but no trace of Lieutenant Null was found. It is believed that Lieutenant Roth died of exposure after being caught in the terrific storm which swept Lake Erie on July 5.—*Aviation,* 16 July, 1923.

ORDNANCE

Elevation and Range of British Guns.—The military value of high elevation in the turret guns of battleships is a subject on which considerable discussion has taken place in the United States during recent months. Public interest was first attracted to this question by positive statements, apparently emanating from the Navy Department, that British battleships of the post-Treaty fleet had, on the average, a higher angle of gun elevation than American ships, in consequence of which the former were able to outrange the latter by several thousand yards. This superiority of range on the part of British ships was due, it was alleged, to alterations made in their turret mountings since the war, or at any rate at some time subsequent to their original entry into service. On the strength of these reports Congress was requested to appropriate funds for modernizing the United States battle fleet, and particularly its turret gun mountings, with a view to enabling the ships to use their artillery at maximum range, thus annulling the advantage which the British Fleet was supposed to have in this respect. After the money had been duly appropriated, the British Government announced, through the usual diplomatic channels, that no alterations of the character indicated had ever been made in the turret mounts of any ship of the Royal Navy since its completion. This categorical denial was at once accepted by the United States naval authorities, the courteous tone

of Acting Secretary Roosevelt's retraction being much appreciated in England. Apparently, however, a conviction still prevails at the Navy Department that the shooting range of the British Fleet is higher than that of the United States Fleet, and accordingly it has been proposed to carry out the plan of enlarging the gun elevation of thirteen ships: viz., *Florida, Utah, Arkansas, Wyoming, Pennsylvania, Arizona, Oklahoma, Nevada, New York, Texas, Mississippi, Idaho, and New Mexico.*

It may therefore not be inopportune to outline some of the technical aspects of this question as seen from the viewpoint of a British naval student. Obviously it would be desirable to give all main battery guns the extreme limit of elevation practicable: *i. e.,* that forty-two degrees or forty-three degrees equivalent to maximum range in most cases, if this could be obtained without corresponding disadvantages; but it cannot. Compromise is necessary, and the following remarks convey an idea of the factors governing this compromise:

To glance first at earlier times: In the prolonged naval wars with France, Holland and Spain, the truck guns carried in the British Fleets were given a maximum elevation of ten degrees to fifteen degrees, and a search through the archives reveals no complaint that this limit was insufficient. A larger elevation would have involved a deeper gun-port, or else the gun muzzle would strike the top sill on recoil. A lower elevation was unacceptable for another reason. In the course of the famous English maneuver, the attack from windward, their ships were all listed by the wind toward the enemy. This circumstance greatly favored the speed with which a broadside could be fired, since the heeling over of the ship provided a natural "ramp" or incline which checked the recoil of the guns and accelerated their running-out after loading. The enemy ships, on the contrary, suffered from the corresponding disadvantages. And, in the case of the French Fleets, a further cause of inferiority resulted from their tactical policy for whereas the English fired low, so as to damage the enemy's hull, the French generally fired high in the hope of dismasting their opponent. Both sides therefore required a certain elevation for their guns, but the French more than the English.

When, about the middle of the nineteenth century, the power of ordnance became too high to be controlled in truck carriages, slide mountings were introduced; the gun, on recoil, ascended a fixed sloping path and thereby expended the energy of its recoil. But great difficulties were experienced in controlling this recoil. If fired at too low an elevation the gun ran up too violently, while if fired at a high angle the downward blow on the slide was excessive. The steeper the slide, and the higher the maximum elevation of the gun, the more dangerous the blow became and the less distance the gun recoiled. Eventually it was found necessary to limit the incline of the slide to fifteen degrees, and the elevation of the gun to fifteen degrees also. The above system was superseded, as the power of ordnance further developed, by the great Elswick invention of the hydraulic recoil-buffer, which allowed the gun to recoil axially whatever its elevation. This system permitted of high elevations, which some naval officers thought desirable. When the British Fleet went up the Dardanelles during the Russian crisis of 1878 there was not a single gun which could bear on the Turkish batteries, and it was fortunate for the fleet that no hostile demonstration took place. Some years later the Elswick firm designed turrets whose guns had forty degrees elevation, and several of these were supplied to the Italian Navy.

But official naval opinion was in all countries opposed to accepting certain positive disadvantages for the sake of obtaining high-angle fire. The chief disadvantage was one which had operated in all stages of artillery development, with the truck gun as well as with the turret: viz., the necessity of a larger gun port. In a turret the guns project through

thick armor walls, and to allow them to be elevated and depressed large elongated holes have to be cut, leaving unprotected gaps. The higher the range of elevation, the greater these gaps must be; and although they may be covered or filled by screens or sliding plates of armor, they still remain as highly vulnerable patches, "weak joints" in the armor of the gun turret. How to minimize the effect of these gun port gaps is one of the problems of the turret designer. In United States ships the trunnions are usually placed close to the front sloping armor plate. With the exception of Germany, no nation before the war paid any particular heed to this feature of maximum elevation, and even in Germany's case the interest was but transient. The turret guns of her battleships and armored cruisers of the pre-dreadnaught era had unusually high elevation, thirty degrees at least, which probably gave them an exceptionally long range for their power. But when the first German dreadnaughts came to be built, their turret guns were given a maximum elevation of only sixteen degrees, nor was this exceeded in any of their later ships. When going over the German battleship *Baden* after she had been surrendered three years ago, I was surprised to find that her 15-inch guns could not be elevated above sixteen degrees. This disproved the reports which had been current during the war, that our ships were invariably outranged by the enemy owing to the superior elevation of his guns; the real truth being that in the Jutland and the Dogger Bank actions our heavy guns opened fire at ranges at which the Germans could not reply.

The almost universal disregard of high elevation before the war was due to the fact that in improving the hitting power of heavy projectiles all navies were incidentally developing ranging power to an extent which was thought to be far beyond the scope of accurate fire. Battle ranges were always thought of as within the 12,000-yard limit, and as most modern big guns gave this range with a small elevation, there seemed no necessity for a greater one. The old maximum of fifteen degrees was accepted as a standard.

No mystery has ever been made about the maximum elevation of British naval guns. The battleships of the *St. Vincent* class, built in 1908, which first carried the powerful 12-inch Mark XI 50-caliber guns, attained a range of over 20,000 yards with their extreme elevation of fifteen degrees. With the adoption of the 13.5-inch gun for the *Orion* class, with a lower muzzle velocity, it was evidently found necessary, in order to maintain the required standard range, to provide for an elevation of twenty degrees. This maximum angle was maintained when changing over to the 15-inch caliber, mounted in the *Queen Elizabeth* class, and with it an augmented range of over 24,000 yards was achieved. Then, during the early days of the war, the value of very high range in special circumstances was demonstrated. At the Dogger Bank action firing began at 19,000 yards; at the Falkland Islands battle the Germans gambled on getting a hit at 21,000 yards. Presumably for this reason it was decided to give the guns of the four new battle cruisers of the *Hood* class a thirty degree elevation, corresponding to 30,000 yards. This was done; but as, at the armistice, three of the four new ships were scrapped as they lay on the stocks, only the *Hood* herself remains, carrying guns identical with those of the *Queen Elizabeth,* but with the enhanced range due to thirty-degrees elevation. No alteration has been made in any other British gun turret.

In the *Hood,* therefore, disadvantages have undoubtedly been accepted to obtain the extra ten-degrees elevation, and it may well be questioned whether the gain compensates for them. It is obvious that, as each gun and its mount sweeps through an extra ten degrees, a deeper turret has to be provided. A longer elevating screw or cylinder is necessary, as also a larger gun port and larger sight holes. Extra power is needed to ram

the heavy projectile up a steeper incline when loading at thirty degrees, and to close the massive breech—difficulties which would not, of course, arise in the case of American guns, which are understood to have fixed-angle loading. And extra stiffening may have to be provided to take the greater shock to which the structure is exposed when the gun comes crashing down in recoil. It may even be doubted whether the speed with which the gun can be loaded at so high an elevation is equal to that when it is nearer the horizontal. The net gain in all-round efficiency is therefore decidedly problematical.

The position, then, is this. The battle cruiser *Hood*, armed with the 15-inch Mark I gun, firing a 1920-pound projectile at a muzzle velocity of 2,450 foot-seconds, can shoot 30,100 yards with her 30-degree mountings. *But all the other ships of the British battle fleet have only twenty degrees of elevation,* and their extreme range is therefore 24,000 or 20,000 yards, according to whether they carry the 15-inch or the 13.5-inch gun.

There is an impression in England that the American Fleet already includes several ships with their main battery guns mounted for at least thirty degrees' elevation: viz., the *Maryland, Colorado,* and *West Virginia,* if no others; and as these vessels are armed with a 16-inch 45-caliber piece, their range, thirty degrees, ought to be well above that of the *Hood's* 15-inch 42-caliber guns. The popular notion that increased elevation gives much longer range is illusory. For instance, if the *Hood's* guns were converted to forty degrees, the gain in range would not be more than 4,000 yards. Apart from the angle of firing, gun range may be increased either by using specially-shaped projectiles—with stream-lined "wind-cheating" noses, like those used by the French at the land front during the war, and similar to the German "Spitz-Granate" employed for very long-range bombardment by heavy guns—or by reducing the factor of safety: *i. e.*, increasing the propellant charge; or by listing the ship. All these expedients were tried during the war, but all have manifest drawbacks. Little need be said here as to the actual *military* value of what may be called super-range in ships' artillery. In theory, hitting is possible up to the extreme limit of range; in practice, the percentage of hits obtained at anything above, say, 24,000 yards, on a target moving at high speed and on a varying course, would probably be nil.—Hector C. Bywater, in *Scientific American*, July, 1923.

ELEVATION AND RANGE OF UNITED STATES AND BRITISH GUNS

U. S. NAVY

No. of Ships	Caliber of Guns	Length of Guns in Calibers	Elevation of Guns in Degrees	Normal Range
3 Battleships	16″	45	30	32,000
2 Battleships	14″	50	30	34,000
3 Battleships	14″	50	15	22,000
6 Battleships	14″	45	15	20,000
2 Battleships	12″	50	15	22,000
2 Battleships	12″	45	15	20,000

BRITISH NAVY

2 Battleships	16″	42	30	32,000
10 Battleships	15″	42	20	24,300
4 Battleships	13.5″	42	20	23,800
1 Battle cruiser	15″	42	30	30,100
2 Battle cruisers ...	15″	42	20	24,300
1 Battle cruiser	13.5″	42	20	23,800

NAVIGATION AND RADIO

Ocean Currents Charted.—Washington, July 10.—The United States Hydrographical Office is now constructing a chart of currents of the world which will "save millions of dollars each year for the owners and will shorten the number of days at sea of the ship taking advantage of the route which has the most favorable currents."

To aid this work, Navy Department officials have requested all captains to throw over bottles containing drift report papers every four hours during their voyage.

When picked up and reported these papers will give data for the chart.—*Baltimore Sun,* 10 July, 1923.

Lighthouse to Honor Columbus.—A lighthouse of unrivaled altitude and power, embodying all the most modern devices to insure the farthest transmission of its rays, was proposed as a memorial to Christopher Columbus by delegates from Santo Domingo to the Pan-American Conference, according to advices which have been received by the Pan-American Union. It would be built on Santo Domingo and paid for and supported by the twenty republics of the Western Hemisphere. We read in Science Service's *Daily Science News Bulletin* (Washington):

"The location is advocated by the Santo Domingans because that island was the site of the first Spanish city in the New World, founded by Columbus himself, who lies buried there. The light would be placed upon a sufficiently high elevation so that its rays might be seen by vessels traversing the principal routes from Europe to the Panama Canal. Plans already submitted call for a unique design, that of a lighthouse surmounting a globe 150 feet in diameter, the lantern itself to be 385 feet above the ground. As a final touch it is proposed that the light be of the flash type and that its particular flash be the word 'Colon' spelled out in the Morse code, reminding all travelers by the great sea route of the Western Hemisphere of the name and fame of the discoverer of the continent."—*Literary Digest,* 23 June, 1923.

New Cruiser to Try "Sonic" Depth Finder.—Washington, July 5.—A line of soundings across the Pacific Ocean from San Francisco to Australia, taken at intervals of about five miles by the sonic depth finder, will be run this summer by the new scout cruiser *Milwaukee,* soon to leave on her "shaking down" cruise. The itinerary of the cruise is now being prepared by the Navy Department, and it is expected to include a visit to Melbourne or Sydney.

The Pan-Pacific Science Congress will meet in Melbourne from August 13-22, and in Sydney from August 23 to September 3. It is intended to have the results of this unique survey of the Pacific ready for presentation at the congress, following the *Milwaukee's* voyage.

Other Vessels Being Equipped

Other new vessels of the Navy are being equipped with the sonic depth finder, and when sent out on their trial cruises will make soundings in many widely separated parts of the sea. Older vessels will be so equipped when undergoing repairs or overhauling.

Many new soundings are now being made by naval vessels equipped with the new sounding apparatus, which measures the depth by measurement of the time necessary for a sound wave to travel to the bottom and back again. Soundings may be taken while running at full speed.

Recording Results of Surveys

The Hydrographic Office is busy recording the results of these new surveys, which agree quite closely with older soundings made by line, but which, owing to the rapidity with which they may be taken, are opening up many partly charted and little known regions of the sea.—*Baltimore Sun,* 5 July, 1923.

PHOTOGRAPHING OCEAN'S DEPTHS.—Professor Barry MacNutt, of Lehigh University, is carrying on experiments in that institution's swimming pool with the hope of devising some means of taking photographs of the bottom of the ocean, or moving pictures of the *Lusitania* or other sunken ships. He is trying to simulate the phosphorescence of the waves in such a manner that the water beneath the surface may be made luminous enough to permit photography. Experiments will be made in the swimming pool in lighting up under water by spraying with a chemical substance.

Should the experiments prove successful it will be possible for a diver to descend, use the spray, and then take photographs in the luminous cloud thus generated. At present it is impossible at a depth of more than fifty feet, and movies of the "bottom of the sea" must either be made in tanks, or taken very close to shore.—*Nautical Gazette,* 30 June, 1923.

"RAT-TAIL" TOWER FOR ANNAPOLIS.—Plans and specifications soon will be advertised for bids for the construction of a fifty foot steel "rat-tail" tower at the naval radio station, Annapolis, which consists of leads from the lofty antennæ, extending down to the sending apparatus. Although guyed in three directions, the rat-tail is subject to violent whipping action in high winds, with a consequent tendency to break away from the machinery. The new tower, a novelty in radio practice, will confine the whipping to the upper portion and afford a steady connection for sending. It will be surmounted by a rack forty feet long and two feet wide for the attachment of the individual wires of the rat-tail, with an operating platform three by forty feet, parallel and at a slightly lower level, for convenience in getting at wires and insulators.—*Army and Navy Register,* 30 June, 1923.

"LEVIATHAN" WINS RADIO RECORDS.—On the trial of the *Leviathan* all radio records were outdone. The vessel established a new high mark for constant distance transmission and in the operation of the duplex telegraph and telephone system.

Fifteen thousand words a day were handled in the radio office of the great liner. This traffic was the heaviest ever handled from a ship to shore. A hundred or more newspaper men filed the ship's history daily, and the resulting terrific pressure wore out the four radio operators assigned to the ship.

According to David Sarnoff, vice-president and general manager of the Radio Corporation of America, who was aboard the *Leviathan,* there were more messages sent and received daily on the ship than are handled every

twenty-four hours between the United States and any one European country. During the last day at sea everything known in radio was employed to handle the tremendous volume of business, and the transmission was expedited by the use of the duplex simultaneous sending and receiving apparatus so that four operators were working at the same time.—*Nautical Gazette,* 30 June, 1923.

MISCELLANEOUS

Rhine Army Bill.—Elliot Wadsworth, Assistant Secretary of the U. S. Treasury, in Paris since February to secure payment of the Rhine Army Bill, arrived in the United States on the *Olympic.*

He said that he has made a satisfactory arrangement with the Allies and the United States will receive from the Reparations Commission between $240,000,000 and $245,000,000 in twelve annual payments, starting on December 31.—*Time,* 18 June, 1923.

Chinese Navy Seized Arms of Exile Fleet, Says Admiral.—Manila, July 13.—(By Wireless.)—Admiral Starck, commander of the Russian refugee fleet, when interviewed today regarding arms smuggling in China declared:

"Our arms, worth 400,000 Mexican dollars ($100,000) and also three small unseaworthy boats were turned over to Chinese naval men at Shanghai under compulsion prior to our sailing for the Philippines. We did not receive a cent.

"The demand was made on us by Captain Hsu, of a Chinese gunboat. He threatened not to give us coal and also to cut our communication with shore. He was accompanied by Lawrence H. Kearney, said to be an American, who had documents to prove that he represented a Chinese admiral. Since leaving China we have not heard from either man. We hold official Chinese receipts and do not know anything of reported attempts to smuggle."—*Philadelphia Public Ledger,* 14 July, 1923.

Collier "Cyclops" Mystery Still Causes Speculation.—The area in which the collier *Cyclops,* mystery ship of the World War, might have sunk overlapped the known area of German submarine operations on this side of the Atlantic, according to data now in the hands of the Naval Reserve Force here.

This is taken by some to mean that the theory that a torpedo sent the warship to the bottom is strengthened—made almost as strong as the widely accepted explanation that the nature of the cargo and a rough voyage combined to produce the disaster.

The *Cyclops* left Brazil for the States in March, 1918, and was last seen when it cleared from Barbados, in the West Indies, where it stopped for coal. In the crew of 295 men were fifteen Marylanders, thirteen of them from Baltimore. Lieutenant Commander George Wichman Worley, of the reserve force, commanding officer, lived at Norfolk.

The Navy Department has announced that the collier might have been lost as far north as the Virginia Capes. Operations of German submarines, it is disclosed, extended some distance south of Cape Hatteras.

There remains, however, this discrepancy: No German *U*-boats are known to have been in the vicinity as early as March of that year. The operation on this side of the Atlantic reached its peak in August, 1918.

A chart of the navy intelligence service shows that a great number of mines were planted off the Virginian Capes. These may have drifted south along the coast, and one of them may have spelled doom to the collier.

A ship built at Brunswick, Ga., and said to have carried a number of spies, is known to have been seized off the Chesapeake about that time. At

least one important person with strong German connections is known to have been on board the *Cyclops.*

A group of naval reserve officers here in discussing the mystery agreed with an opinion expressed this week by Captain Charles H. Zearfoss, of the Munson Liner *Southern Cross,* that the vessel was sunk by her own cargo.

The torpedo and mine theories are still regarded as of secondary importance because it is pointed out that the *Cyclops* could have sent out at least a few S. O. S. calls before it went down. Moreover, floating wreckage would have been found.

The bottle containing a message that was recently found on the beach near Atlantic City and that was thought in some degree to explain the loss of the collier, could not have come from the *Cyclops,* Captain Zearfoss thinks.

"The end was so unexpected and came so suddenly that there was no time to write messages," he says.

The *Cyclops* sailed from Rio de Janeiro in good condition carrying a full cargo of manganese ore.

"I think the *Cyclops* was sunk by her cargo," says Captain Zearfoss. "Manganese is a very difficult cargo to handle and the collier's crew was used to handling only coal. It has a tendency to settle down, grinding away whatever is below it. The *Cyclops* was not a 'tween deck ship, and the cargo was loaded in the lower hold. I think the end came suddenly, when the bottom practically dropped out."

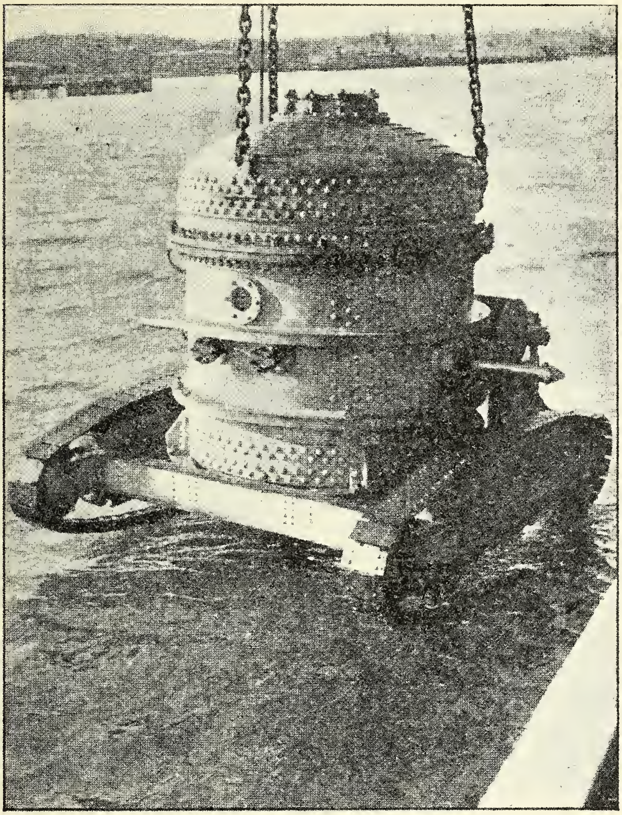
"At one time," he says, "we loaded with manganese and about two feet of the ore was left on top of the hatch. When we reached port we found, with surprise, that in grinding down this ore had splintered the heavy planks of the hatch cover, and had twisted and torn the steel beams beneath it."

It is held that the usual danger of transporting manganese was increased when the collier ran into a tropical storm.—*Baltimore Sun,* 27 June, 1923.

Submarine Tractors to Raise Wrecks.—A system of marine salvage devised by Jesse W. Reno does not employ divers, and hence is not limited in its operation to depths at which divers may safely work. It employs a submarine tractor which moves on the sea-bottom and can operate at depths that would be fatal to any diver. A crew goes with the tractor and operates it, but its members remain within a large and strong steel caisson and carry on operations without leaving it. The tractor has "caterpillar wheels" and carries powerful searchlights. A contributor to *The Nautical Gazette* (New York) is of the opinion that this device is a challenge to the "sea's hold on sunken wealth," and that we are to witness salvage operations on a gigantic scale by its means. He begins his account by telling of the recent raising of the tug *Scally,* in Long Island Sound:

"A little group of men stood on the deck of a lighter moored off Whitestone Landing, Long Island Sound, last week, eagerly watching an unbroken expanse of ocean. Then these who kept vigil were rewarded for their faith and patience by seeing a number of dark objects followed by a funnel, and superstructure of a vessel emerge from the waves and float safely on the surface. Immediately three tugs lying in the vicinity blew loud and triumphant blasts on their sirens, the watchers on the lighter gave lusty cheers which were echoed by spectators on the distant shore. The dark objects were the heads of pontoons used in the Reno marine salvage system, the funnel and superstructure belonged to the Coast Guard cutter *Scally,* which had been lying submerged in sixty feet of water for several months, and their appearance proclaimed the success and practibility of the salvage system invented by Jesse W. Reno of New York.

"There was far more involved in this demonstration than the mere raising of a sunken ship; it marked the opening of a new vista in the reclamation of wrecked vessels and cargoes. Not one new or untried principle in either mechanical or hydraulic engineering is employed, but by gathering into one coherent system known and proved processes Jesse W. Reno has answered the challenge of the sea and has devised a means for wresting from the depths the immense stores of wealth which the ocean has taken as its toll.



A Tractor that Tracks Sunken Treasure

"During recent years many schemes have been invented for salvaging lost ships, but most of them have consisted mainly of a form of diving-suit which enabled a man to descend far enough below the surface of the sea to reach the wrecks. The most extravagant claims for these devices, however, have never gone beyond comparatively shallow water and the field of salvage has been limited to the depths at which men have been able to work. The Reno system, however, does not depend upon a diving-suit, but employs as one of its two main working units a submarine tractor which moves around at the bottom of the ocean. This tractor can descend

to great depths sufficient to reach any known wreck. There is not a wreck which can hide from its powerful searchlights nor escape from its giant caterpillar wheels.

"This tractor carries a circular steel caisson seven feet in diameter and nine feet high on the inside, the whole weighing eighteen tons on the surface. Two men operate the tractor from the inside of the caisson, air being supplied by the same system as that used in submarines. Drills project from the sides of the caisson, the leakage of water through the apertures through which the drill shafts pass being prevented by stuffing boxes. The tractor is lowered to the bottom from the mother-ship, which supplies the power through cable to an electric motor inside the caisson. This motor drives the tractor belts and also operates the drills."

The tractor draws up alongside the wreck, and holes are drilled through the plating of the ship, the number being regulated by the weight to be lifted, and their position by the distribution of the load. Pontoons to which hooks are attached are then drawn down and the hooks inserted in the holes. These pontoons are of the open-ended type and the buoyancy is so arranged that they remain vertical. To the head of each an air hose is attached and after all are in position air is pumped down and the water in the pontoons is forced out, thereby creating a buoyancy sufficient to lift the ship. The pontoons are then lashed so that they become an integral part of the wreck, which is towed into dry dock or beached. We read further:

"It does not require too great an imagination to understand what valuable services the apparatus can render. Around the shores of Britain and France there are approximately 1,600 ships sunk by submarines during the war, most of them lying in about 100 feet of water, and many of them carrying individual cargoes valued at over a million dollars. During the two years following the war the British Salvage Association recovered ships and cargoes valued at over $400,000,000, and all they salvaged were those lying in comparatively shallow water. Some of the greatest prizes are those lying in deep water, but easily available under the Reno system. Furthermore, it has frequently been necessary to blow up sunken vessels as dangers to navigation, but these can now be saved intact.

"It is these vessels lying in shallow water which will first claim the attention of the Reno Company, an official of which is now in England making an investigation of these war wrecks."—*The Literary Digest*, 14 July, 1923.

Turks Rescind Rules On Americans' Visas.—Constantinople, July 5.—(By Wireless.)—The Turks have given Americans the same privileges as the Allies as to entering Turkey without special visas from Angora.

It is a diplomatic triumph for Admiral Bristol, who has gained without force a right accorded to the Allies on account of their armies of occupation.

The rule requiring all foreigners to get an Angora visa to leave Turkey has been repealed.—*Philadelphia Public Ledger*, 6 July, 1923.

Turco-American Accord Assured.—Lausanne, June 19.—Negotiations for the revision of the various antiquated Turco-American treaties are proceeding favorably here and it is confidently expected a complete accord will be reached between the American and Turkish representatives by the time the general Near Eastern peace conference is brought to a close.

The American attitude has been one of frankness from the start. Joseph C. Grew, minister to Switzerland, observing the policy adopted at the Washington Conference by Secretary of State Hughes, went with his colleagues before the Turks with concrete written suggestions as to just

how the future legal arrangements between Turkey and the United States should be framed, without concealments or implications. It is expected that one broad, general treaty will emerge from the Turco-American negotiations, replacing the three conventions now in existence.

The Turks have recognized the liberal nature of the American suggestions and are doing their best to meet them. In the discussions over details the Americans and the Turks have gone further in some respects than the Turks and the Allies in their protracted negotiations.

An example is the revision of the old extradition convention. The Americans have suggested more clarification regarding the status of consular officers, their immunity from taxation and arrest and their obligation to testify before the courts. The Turks seem willing to permit cases involving the personal status of Americans to be tried by American tribunals outside Turkey. If the parties affected, however, are in accord, the cases could be tried before Turkish courts. Proper attention is being shown also to fixing definitely the status of American business interests in Turkey.—*Philadelphia Public Ledger,* 20 June, 1923.

New Scout Cruisers and Torpedo-Boats for Argentine.—Buenos Aires (by mail).—It is learned that the Argentine Government proposes to strengthen its fleet by the addition of twelve scout cruisers and a small torpedo boat flotilla. The vessels, it is understood, will replace those that were under construction in European shipyards for this country at the outbreak of the war. The hulls were taken over in 1914 by the nations in whose yards they were being built.—*Reuter.—Naval and Military Record,* 13 June, 1923.

Warships Bombard Paraguay Rebels.—Buenos Aires, July 12.—The Paraguayan revolutionists' attack on Asuncion, the capital, was a more sanguinary affair than indicated in the first reports on Monday's and Tuesday's fighting.

It is believed the official estimate of seventy killed is considerably below the actual number, not taking into account bodies found at several different points where fighting occurred.

The revolutionary forces succeeded in reaching the city by eluding the Government troops who were encamped in the hills awaiting their attack. They entered in four columns, of which the largest was 1,000 strong, and found only a small garrison to oppose them.

With the aid of volunteers, however, the Federal troops succeeded in ousting the rebels from the public buildings in which they fortified themselves, and finally forced them to retreat from the city. President Eligo Ayala took refuge on a gunboat which, with another war vessel, bombarded the revolutionary strongholds, including the Government warehouse, which caught fire and was destroyed. Much other property was damaged.—*Philadelphia Public Ledger,* 13 July, 1923.

Russo-Japan Pact Believed Certain.—Tokio, June 17.—(By Wireless.)—The Japanese Government, when it accepts M. Joffe's credentials, which is certain to be done, will resume official relations with the Soviet, and the opinion in official circles here is that a resumption of relations now indicates undoubtedly that both Governments anticipate positive results from the forth-coming negotiations.

The Foreign Office, today received the credentials by cable from Moscow giving M. Joffe status as the official Soviet representative, and he is sure to be acknowledged by Japan. The credentials were requested of Moscow by M. Joffe following his conference with Viscount Goto a week ago, when the Japanese Government's willingness to negotiate was conveyed to the Soviet.

Last week saw a lull in Russo-Japanese affairs while Tokio was awaiting the credentials, but officials said today they believed pourparlers looking to a conference would begin this week. Toshipsune Kawakaami, the Japanese Minister to Poland, who is now on vacation in Tokio, will be the representative of Japan at the pourparlers, which will be held in the Tsukiji Seiyoken Hotel here.

According to statements given out by both Russian and Japanese officials, the pourparlers will open with the previous conferences and conversations forgotten and the delegates endeavoring to approach with a clean slate every controversial point.—*Philadelphia Public Ledger,* 18 June, 1923.

Amundsen's Flight Abandoned.—Christiania, Monday.—The Minister of Defense has received the following telegram from Dover from Mr. Leon Amundsen, brother of Captain Ronald Amundsen:

"Just received the following telegram dated Norwick, Alaska:

"Trial flight May 11. Result very unsatisfactory. Sorry forced abandon proposed flight. Have written."—*Reuter.*

Further and more detailed news with regard to the reasons which led to the abandonment of the great adventure on which Captain Amundsen was expected to set out this week will be awaited with interest. Preparations for the projected flight have been long in hand, and less than a week ago it was announced from Spitzbergen that the supporting expedition had left King's Bay for the North. This supporting expedition included Airmen, who, it was said, left in splendid weather, though afterwards fog came over the sea and snow fell. The interesting information was added that before leaving they had made experiments in descending in their seaplanes on the snow, and that these experiments had been successful. This adds a little touch of mystery to the news that Amundsen's own trial flight in far-away Alaska had been unsatisfactory.

Amundsen's intention was to make an aeroplane flight from Alaska to Spitzbergen. It would have been a very long and hazardous flight. The distance between Wainwright Inlet, Alaska, whence he was to set out, and the North Cape, Spitzbergen, where he hoped to land, is 2,614 miles in a straight line, so that it was to be the longest non-stop flight in the world. This fact, added to the severe climatic conditions likely to be encountered even in this favorable season of the year, gives an idea of the greatness of the adventure on which the explorer intended to embark.

If it can be accomplished another year the flight will be of interest from many points of view. It will take those who make it across the almost unknown Polar basin and over the North Pole itself. Setting out due north from Wainwright, the route passes over the Pole, and then due south to North Cape.

According to Amundsen's calculations the distance should be covered in twenty-two hours, but this meant an average speed of nearly 120 miles an hour, so that the anticipation was optimistic. In the event of engine trouble being experienced after the North Pole was passed, Amundsen and his companion, an experienced pilot, hoped to make North Cape by ski over the broken ice. It was partly in view of such an ending that the Norwegian Government sent the supporting expedition with its seaplanes to patrol the ice ridge and keep a look-out for the explorers. But any help it could render would only come at the end of the journey. For over 2,000 miles the adventurous airmen would be beyond the reach of assistance of any kind, and it is no doubt the realization of this fact, and on proof that all was not well with his equipment, that Amundsen has put off—if not actually abandoned—an enterprise fraught with the greatest personal risk.—*Naval and Military Record,* 20 June, 1923.

GUNGA DIN.—Major-General Sir Geo. Younghusband, K.C.M.G., K.C.I.E., has followed the fashion and written his reminiscences, which Herbert Jenkins, Ltd., have published attractively, in *Forty Years a Soldier,* 16s. The book, breezily written, is well illustrated, and full of excellent stories and stirring incidents.

There is told quite casually the history of Gunga Din, the origin of Rudyard Kipling's immortal character, known wherever servicemen congregate.

Jemadar Jumma was his name, and at the siege of Delhi in 1857, he was with the Guides at the hottest time of the year, in the hottest region on earth, as a camp follower, a bhisti, not a soldier at all, but a humble regimental servant, a carrier of water for the soldiers, engaged on a monthly salary of 6s. After one of the fiercest fights the General decided that an Order of Merit, the highest decoration of valor, should be bestowed on the men collectively, and that they should vote amongst themselves as to whom the coveted medal should be given. With one accord the soldiers voted for Jumma and further petitioned that he might be enlisted as a soldier—a great tribute to courage as those will appreciate who know the East and its drastic caste distinctions. So fine a fellow was he that in spite of his humble origin and caste prejudices, he rose to be an Indian officer, and gained the rare distinction of a clasp to his Star for Valor. Yet, for committing the merely menial crime of telling a lie to shield his superior officer, he was sentenced by a British Court-martial to be cashiered, and was disgraced for life, with only a month's pay in his pouch.

One day subsequently Colonel Jenkins, of the Guides, was walking down a London street when he found Jumma, surrounded by a crowd, and exclaiming in Hindustani: "A great injustice has been done to me. I am a stranger amongst strangers and will do no harm. Only show me the way to the Palace of the Great Queen, that I may lay my petition before her."

In the Colonel's room later Jumma related his story. He determined to place his case before the Great Queen. He only had a few rupees and took menial employment here and there. He traveled the greater part of 1,000 miles on foot, and becoming a coolie worked his way as a ship's fireman to England.

Colonel Jenkins took him to the India-office, explained his case, and received a patient hearing. As the result, Jumma was sent home as a passenger, and was given money from the Queen for his expenses. When he arrived in India, he was given a post of trust and authority in the Canal Department, and lived in fair plenty and contentment for the rest of his days.—*Naval and Military Record,* 4 July, 1923.

DAY OF UNIVERSAL LANGUAGE IS NEAR, SCIENTISTS DECLARE.—New York, July 11.—Believers in the international language movement, among them many scientists, will meet at Union Hill, N. J., today, when the Esperanto Association of North America opens its sixteenth annual convention.

The International Auxiliary Language Association, through a committee consisting of General John J. Carty, Dr. F. G. Cottrell, Mrs. James S. Cushman, Dr. John H. Finley, Dr. Arthur A. Hamerschlag, General James C. Harbord, Clarence H. Howard, Dr. F. P. Keppel, Mrs. James Lees Laidlaw, President Sidney E. Mezes of the College of the City of New York, Mrs. Dave H. Marris, Mrs. Charles L. Tiffany and Dr. Herbert N. Shenton, of Columbia, has issued a memorial declaring that "the day is at hand for establishing an international auxiliary language which shall provide the means for easy intercommunication between peoples of divers mother tongues, whether by the adoption of one of the existing synthetic

languages, as, for example, Esperanto, Ido or modern Latin, or by the creation of a new language based in so far as may be found desirable upon these."—*Baltimore Sun,* 11 July, 1923.

Personnel of Six Leading Navies Before and After the War.—The following tables, which show the personnel establishments of the six leading navies before and after the war, are taken from *Nauticus:*

	Officers, Deck and Engineer.	Surgeons, Paymasters, Chaplains.	Warrants, P. O's and Seamen.	Marines, Coast Artillery.	Total.
	In 1914.				
Germany	3,152	642	67,795	7,793	79,386
Great Britain	4,710	1,489	123,036	22,126	151,363
France	2,213	631	62,611	1,400	66,000
Italy	1,594	481	35,000	4,630	42,130
Japan	3,373	740	50,550	———	54,700
United States	2,499	571	55,857	10,263	69,200
	In 1922.				
Germany	806	171	14,023	———	15,000
Great Britain	4,692	1,186	96,203	16,322	118,403
France	2,487	494	55,000	25	58,006
Italy	1,850	439	38,104	240	40,633
Japan	7,739		67,714	———	75,453
United States	4,153	1,683	88,383	19,500	113,719

—Hector C. Bywater in *Naval and Military Record,* 4 July, 1923.

CURRENT NAVAL AND PROFESSIONAL PAPERS

"Radio Telephony for Amateurs." By Stuart Ballantine. The author, formerly Expert Radio Aid, U. S. Navy, and now Electrician, Radio Frequency Laboratories, Inc., states in his preface "Since 1908 I have longed for the appearance of a certain type of radio book . . . . from the pen of an amateur . . . . chockful of practical information. . . . Such a book has never appeared, nor ever shall, for we all have our own ideas as to what it would be like."

However, we can safely state that the author has, in a great measure, achieved his object. The book presents clearly and definitely the steps that the average amateur could most easily follow in gaining a basic knowledge of radio and in constructing a simple receiving set, and, as one reads further it gradually adds sketch, description and theory of more complicated types of apparatus.

The diagrams are clear, and some bring in details of unusual and novel construction. Each "hook-up" is accompanied by a statement of the values of the constants of the component parts of the sets, so that the handy man can reproduce the set experimentally or for more permanent use.—From Book Reviews, *C. A. Journal,* June, 1923.

"Practical Radio." By Henry Smith Williams. Dr. Williams is author of an imposing list of books on science, and has the happy faculty of presenting obscure scientific facts and theories in such simple language and illustrating them by such simple analogies that the reader soon feels that

they are "not half so bad as they have been painted." His chapter on "The restless electron and the radio hook-up" is almost a classic on the internal happenings in the vacuum tube. The mysteries which are so puzzling to the average amateur are presented in the clearest possible way.

Many excellent circuit diagrams are given of sets used in commercial and amateur practice, with full analysis and descriptions. Some unusual but related subjects are covered, such as radio on trains, transmission of pictures by radio, radio control of distant apparatus, etc.

In the more elementary portion of the work the description of each of the several devices used in radio is accompanied by an excellent illustration, and by its appropriate symbol, which will prove of great assistance to the novice.

A very comprehensive index adds to the value of the book as a reference work which may well be kept constantly near the hand of the radio bug, be he beginner or more advanced.—From Book Reviews, *C. A. Journal,* June, 1923.

"The Determination of Azimuth by Means of Binaural Lense."—Captain Richard B. Welch, C. A. C., in *C. A. Journal,* July, 1923.

"New Naval Promotion Qualification—Art of Handling Men."—*Army and Navy Register,* 7 July, 1923.

"U. S. Crane Ship No. 1—(ex-U. S. S. *Kearsarge*)"—Described completely in *Journal of A. S. M. E.,* June, 1923.

"Aeronautic Instruments," by Franklin L. Hunt, U. S. Bureau of Standards, *Technologic Paper No. 237.*

"A New Theory of Vision," Fritz Schanz, by G. F. S. in *Journal of Franklin Institute,* July, 1923. Based on Electrons.

"Angora and British Empire in the East," by Professor Arnold J. Toynbee in *The Contemporary Review,* June, 1923.

"Germany Revisited," by A. D. McLaren in *Contemporary Review,* June, 1923.

"Flood and Ebb Tide in New York Harbor," by H. A. Marmer of U. S. C. G. S. Department of Commerce, in the *Geographical Review,* July, 1923.

"Hurricane and Tropical Revolving Storms," E. V. Newham, reviewed by Stephen S. Vicker in *Geographical Review,* July, 1923.

"Diesel Engine Progress on the Pacific Coast," by H. W. Crozier, J. Stegen, and C. E. Nagel in *Mechanical Engineering,* July, 1923.

NOTES ON INTERNATIONAL AFFAIRS

FROM JUNE 23 TO JULY 23

PREPARED BY

PROFESSOR ALLAN WESTCOTT, U. S. NAVAL ACADEMY

GERMAN REPARATIONS

BRITISH REPLY TO GERMAN PROPOSALS.—Following extended conversations with French and Belgian representatives, Premier Baldwin on July 12 made a definite statement in Parliament of British policy in regard to German reparations and the Ruhr. The gist of the statement was that Great Britain would assume the task of formulating a reply to the German reparations proposals, and that this reply would be first submitted to the other allies in the hope of securing united action.

Primier Baldwin pointed out that Germany appeared "to be going fast toward economic chaos"; that every country in Europe was paying the price of this condition of affairs; that peace depended on the settlement of three questions—payment of reparations, settlement of inter-allied debts, and security of pacified Europe; and finally that the German proposal of an international commission to settle the amount of reparations, coupled with the promise to pay the amount determined upon with concrete guarantees, ought not to be ignored.

The British note was sent to the United States and the Allied nations before the close of the week ending July 22.

BRITISH REJECT TWELVE-MILE LIMIT

BRITISH COMMISSION TO STUDY QUESTION.—In the House of Lords on June 28, Lord Curzon stated, "There is no chance of our agreeing in any circumstances whatever to the American proposal for a twelve-mile territorial limit." This proposal had previously been made to foreign powers by the American Department of State as a means of reconciling the enforcement of American prohibition measures with the carrying of liquors in foreign ships. Lord Curzon said further that while a ship entering foreign territorial waters subjected itself to the jurisdiction of that country, it was the "common practice" of nations that such jurisdiction should not be exercised except to restrain acts calculated to disturb public order. In October the British Government had pointed out to the United States that application of prohibition to foreign vessels in American waters would be unprecedented.

As regarded the breaking of British customs seals on liquor by American officials, Lord Curzon stated that these seals had no sacrosanct character

and were affixed by British customs officers with the obligation only that they should not be broken in British territorial waters.

A committee composed of representatives of the British Treasury, Board of Trade, Colonial, and Foreign Offices was appointed to study the question of American liquor laws as applied to British ships, with a view of furnishing the government with a basis for its reply to the note of Secretary Hughes.

LEAGUE AND WORLD COURT

Investigation of Sarre Commission.—On July 6 the Council of the League of Nations took up the investigation of the conduct of the commission established under the Treaty of Versailles for the administration of the Sarre Valley. The investigation, conducted by the British representative Lord Robert Cecil, was concerned especially with the presence of French troops in the Sarre, and the decrees issued in March and May when strikes and other disturbances developed in the Sarre coincident with German resistances in the Ruhr. It was regarded as a French victory that the investigation was carried on not by sending a commission into the Sarre but by summoning Sarre officials to Geneva.

Kiel Canal Case Before World Court.—On July 5 the World Court at the Hague met in public session for hearings in the dispute between France and Germany over the Steamer *Wimbleton* in the Kiel Canal. This British steamer chartered by a French company and laden with munitions for Poland, was barred access to the canal by Germany on the ground that the Russo-Polish peace treaty had not been ratified and that transit of war materials for Poland through German territory was therefore illegal. Appeal to the Court was taken by Germany under Article 386 of the Versailles Treaty.

In accordance with the rules of the Court, if in a suit the court does not include in its bench a judge of the nationality of one of the parties, that party may select a judge. Hence Germany selected Professor Walter Schücking, a well-known student of international law. The case of Germany was presented by German representatives in the German language.

RUSSIA

Lenin Still in Control.—Moscow, July 6 (Associated Press).—Although ill, Nikolai Lenin will continue as titular head of the Council of Commissars under the constitution of the new union of Socialist republics, or the United States of Russia. This was decided by the Federal Executive Committee today.

Leo Kamaneff, A. Rykov and M. Buringa were elected Vice-presidents of the Cabinet, or actual executives carrying on the presidency during Lenin's illness. The Cabinet members include the following: Minister of War, Leon Trotzky; Foreign Trade, Leonid Krassin; Foreign Affairs, George Tcitcherin.

The new Constitution for the United States of Russia was formally approved by the Federal Executive Committee, but it must be ratified by the next All Russian Congress of Soviets. The committee also approved the new flag with elaborate coat-of-arms for State occasions, but recommended a simpler red flag, bearing only crossed sickle and hammer, for ordinary use.

The body which elected the Cabinet was one of the Chamber, acting temporarily as a Federal Parliament, pending the election of the two new houses provided in the Constitution. It met in the throne room of the Kremlin Palace, where there were almost as many white collars as soft colored shirts among the delegates, in sharp contrast to previous more roughly clad sessions.

NEAR EAST

Allies and Turks Reach Agreement.—Final agreement on all the outstanding difficulties of the Near East Conference was reported from Lausanne on the night of July 16. As a compromise the Allies agreed not to insist on keeping two warships in the straits pending the establishment of a permanent régime, and Turkey agreed to invite each of the great powers to station one ship there, and also to maintain free passage to the Black Sea. As the United States is not obliged to sign the Straits Convention, it was assumed that American Warships would be free to traverse the straits to any extent deemed necessary by the American Government.

One of the last difficulties of the conference was over the question of concessions. The United States objected to confirmation in the treaty to certain contracts with British oil companies and French railroad concerns entered into before the war. These contracts carried provisions for future preferential treatment which the United States regarded as in conflict with the principle of the open door. In the final agreement the Allies consented to keep confirmation of the Turkish Petroleum Company's Concession (British) out of the treaty and to drop the request for preferential rights in future Turkish concessions.

The treaty as finally agreed upon was regarded as a victory for Turkey, made possible by the inability of Great Britain and the other Allies to count on popular support for military action in the Near East. Turkey loses Palestine, Syria, and Mesopotamia but regains full power in Constantinople, comes back into Eastern Thrace, and secures the practical abandonment of the capitulations formerly protecting foreigners on Turkish soil.

Turkey will join the League of Nations if peace is signed and the delegates believe generally that this will offer opportunities for an amicable settlement of further Near Eastern problems.

The Near East Conference has been in session since April 23, when the delegates resumed the work left undone at the first conference, which

began November 20, 1922, and collapsed on February 4 of the following year.

The primary object of the conference was a settlement as between Greece and Turkey, and on May 26 an agreement to this end was reached. Greece admitted that she owed an indemnity to Turkey, while Turkey renounced enforcement of payments; ratification of the boundary between Eastern and Western Thrace was agreed to, and Greece consented to the cession to Turkey of Karaghatch and of the railroad from Karaghatch to the Bulgarian frontier.

The British, French and Italian Governments early in June approved a formula for judicial guarantees relating to foreign residents in Turkey, and the conference accepted it formally. This provides for the appointment of four foreign advisers without interference with the functions of the magistrates.

The three other outstanding questions, the Ottoman debt, concessions and the evacuation of Turkish territory, have been the central points around which the discussions have revolved for several weeks.

FAR EAST

France Ratifies Pacific Treaties.—Early in July the French Senate and Chamber ratified both the Four-Power Pacific Treaty and the Washington Treaty for Limitation of Naval Armament. As the other powers concerned have previously ratified these treaties, they will become effective as soon as the French ratifications are filed in Washington.

In the French chamber objection was raised against the Pacific Treaty on the ground that no protection was thus extended to French Indo-China. It was pointed out, however, that the other powers did not wish to set a precedent for including Korea or Manchuria, and that such protection as the treaty afforded would extend to French islands in the Pacific. During the debate attention was called to the fact that French colonial possessions exceed the area of the United States, and that the population under French rule in the Pacific area exceeds that under British rule.

The treaties were ratified without modification, but it was expected that the act of law approving the Naval Treaty would carry the explicit statement that France regarded it as binding for only ten years. The Submarine and Gas Warfare Agreement was not ratified, and probably will not be without reservations. The Treaties relating to China were also not ratified.

Chinese Indemnity.—During the conference of diplomats at Peking to settle upon the indemnity to be demanded of China for the Lin Ching bandit outrage, the British representatives proposed joint action of the powers in the nature of a naval demonstration along the Chinese coast and rivers, as a means of restoring normal conditions. Japan, it was reported, considered that such a measure would have little effect.

On July 11 the remnants of the Chinese Cabinet still functioning at Peking were reduced to four. About 220 members of the Chinese Parliament had also left the city for Shanghai.

Peking, July 19.—The Diplomatic Corps met today to consider the recommendations of committees reporting on reparations for kidnapping by Chinese bandits last May of a number of foreigners who were held for ransom. Unless unexpected objections are raised by the home Governments a note will be presented to the Chinese immediately, demanding:

1. The punishment of the Tuchun of Shantung and all officials responsible for permitting the outrage to occur.

2. An indemnity of $8,000, Mexican [$4,000 in American currency].

3. The organization of a guard on the principal railways under foreign supervision.

The recommendations are such as will meet Chinese acceptance, but they will arouse indignation among the captives, many of whom had expected substantial damages. General Munthe, a Norwegian officer, will probably head the railway police, with Chinese assistants.

Feng Yuh-Siang, "the Christian general," has been rewarded for his expulsion of President Li Yuan-Hung by being made a super-Tuchun, commanding Mongolia and Sinkiang, with an increased army.

REVIEW OF BOOKS

A GUIDE TO DIPLOMATIC PRACTICE, by the Rt. Hon. Sir Ernest Satow, G. C. M. G., etc. In two volumes. Second and revised edition. Longmans, Green and Company. $12.50.

A REVIEW BY REAR ADMIRAL A. P. NIBLACK, U. S. NAVY

This *Guide to Diplomatic Practice* is one of a series of *Contributions to International Law and Diplomacy* originally edited by the late Dr. L. Oppenheim, of Cambridge University. The author is well qualified, by a distinguished diplomatic career, to give his readers an excellent outline of those principles and practices which may be said to constitute diplomatic usage. There are three books published as two volumes, Book No. I and Book No. II constituting Volume I, and Book No. III, Volume II. Volume II is complete in itself and is altogether excellent. It deals in sufficient detail with various international Congresses since 1648 and with the various Conferences since 1827, pointing out that, in International Law, there is no essential difference between Congresses and Conferences and, in his opinion, the First and Second Peace Conferences at The Hague, the Conference at Berlin, 1884-85, on African affairs, and the Conference at Algeciras, in 1906, on Morocco, were really worthy to be called Congresses. The chapter on Conferences has been revised in this edition to include the Peace Conference at Paris, in 1919, and the Washington Conference of 1921. Under "Treaties, and Other International Compacts," the author analyzes the "principal parts of a treaty" and quotes the text of many treaties of peace, treaties of alliance, treaties of annexation, treaties of extradition, marriage treaties, boundary treaties, arbitration treaties, etc. He also defines, and gives various examples of, international compacts, conventions, declarations, agreements, arrangements, protocols, procés-verbal, exchange of notes, reversals, arbitration, modus vivendi, good offices, mediation, ratification, adhesions, and accessions. Appendix III has been enlarged to include the literature growing out of international cases arising during the World War. This second volume alone would make it important that the Navy Department furnish this *Guide* to the libraries of Commanding and Flag Officers.

Chapter I is necessarily only a limited guide to diplomatic usage, but much more space could have been given to this feature if not so much had been given to historical diplomatic incidents, which are fascinating and alluring as diplomatic reminiscences and as constituting diplomatic precedents, but somewhat out-of-date for modern purposes. It, at least, makes the volume more readable. Some of the definitions given of

diplomacy are: "The science of external relations of States; the sciences, or art, of negotiation; the application of intelligence and tact to the conduct of official relations between the governments of independent States or of vassal States; the sum of knowledge of the principles necessary for the good conduct of public affairs between States." Merely as a side issue the definition is given of diplomacy as "The means by which policies are pursued." As a matter of fact, it is one of the principal functions of diplomacy. Both foreign and domestic policies are the precautions taken for continued national existence and governments further their policies through diplomacy, the activity of which depends on how vital is the purpose. Diplomatic negotiations between governments usually run a definite course, based on conciliation, compromise, and compensation, or else abandonment. When diplomacy fails it means withdrawal, submission, evasion, or, in the final analysis, war.

Chapter II deals with the "Immunities of the Head of a Foreign State" which have become gradually much the same for a president of a republic as for a crowned head. In Chapter III, he comments on "Ministers for Foreign Affairs" and brings out the fact that, in Great Britain, "the negotiation of treaties rests with the Minister for Foreign Affairs who watches over their execution. The ratification of treaties are exchanged by him or his agents without submission to the legislature, except when money clauses form part of the instrument for which provision must be made by Parliament." Great Britain is the only Great Power where the sovereign does not countersign ministerial orders, thus leaving him full powers. Neither the King nor Parliament can give orders directly to diplomatic representatives abroad. In the United States the President predominates in foreign affairs. The tendency of treaties to become mere "scraps of paper" is a real one where cabinets make treaties without the will of the people being consulted and which succeeding cabinets find contrary to their own policies and desires. Under our system every treaty must be submitted by the President to the Senate, and until other countries adopt a similar system, treaties will continue to be made in which "the happiness, the prosperity, and the lives of millions of men and women are easily placed in deadly peril without their knowledge or consent." In the United States the lack of respect for laws is due to the fact that not only Congress but each of the forty-eight states manufactures annually so many laws which invade so many individual rights as to make law enforcement difficult. The same may be said of modern treaties, which seem to last only until the ink is dry.

Two long chapters on "Precedence Among States" and "Precedence Among Sovereigns" are solely of historical interest as this is now regulated by alphabetic or other equitable practice. Chapter VI on "Maritime Honors" is very incomplete, but, by international agreement these honors are regulated by and published in full in all Naval regulations. A most important chapter in the book is Chapter VII on "The Language of Diplomatic Intercourse and Forms of Documents," which is supplemented in Chapter X by "Definitions of Latin and French Phrases."

The chapters on "Credentials and Full Powers," "Diplomatic Agents in General," "The Right of Legation," "Persona Grata," "Agent Proceeding to his Post," "Immunities of Diplomatic Agents (as to civil processes, taxation, religion, and residence)," "Position in Regard to Third States" and "Termination of a Mission" are highly technical discussions fortified by many examples establishing precedents. Chapter XXIII on the "Diplomatic Body" is probably the most useful in the book as dealing with the mutual relations of the members of the Diplomatic Corps in the various capitals. Paragraph 386, Page 362, Volume I, on the "Order of Precedence on the Occasion of a Personal Meeting," is one which concerns naval officers most at official functions. Where the Diplomatic Corps is present in a body to witness a function, there precedence in sitting or standing is well regulated by the officially published lists.

As regards seats at a table, where the place of honor is, of course, on the right of the host, the author quotes an authority as follows: "At a four-cornered table of which all four sides are occupied, or at a round or oval table, the first place is usually considered to be facing the entrance and the least place is the nearest to it. Counting from the first place the order of seats is alternately from right to left and so on." This means, at a rectangular table, for instance, with three on each side and two on each end, or ten in all, No. 1 would be in the middle of the table facing the entrance with No. 2 on his right and No. 3 on his left, with No. 10 facing No. 1 in the middle of the three persons opposite, who would have No. 9 on his right and No. 8 on his left. This is strictly in accordance also with military precedence. There are some variations of this social official entertainments which the author does not give but which it is important to know. With a long, narrow table it is usual for the host to be faced on the opposite side of the table by the hostess, or Counsellor of Embassy, or Chief of Staff (or whoever is the second ranking person of the official household), with Nos. 2 and 3 on the right and left respectively as above, but with Nos. 4 and 5 on the right and left of the second of the official household. At the Court of St. James, and in England generally, as a variation of this, the male guest of honor is always on the left of the hostess and his wife on the right of the host.

It is amazing what ill feeling or positive hostility may arise through a wrong or fancied wrong seating arrangement, or ignorance of the right seating arrangement. In diplomatic intercourse it is the seeming trifles which are important and which count more than the greater effort to be pleasing. Nor is the offense really taken personally but resented as a slight to the person's government, which he represents. "Shirt sleeve" diplomacy is no improvement on the smooth and insincere diplomacy of the old days with its intrigues, spying, and secret arrangements.

The author quotes from another authority as follows: "In standing, sitting or walking, the place of honor is at the right: i.e., when the person entitled thereto stands or walks at the right. Precedence is when the person entitled goes a step before the other, who is at his left side,

as in ascending a flight of stairs or entering a room." This sounds very elementary, but it is amazing the number of people who do not know that this is the very *a, b, c* of official precedence.

The author quotes from the same authority: "In a lateral arrangement: i.e., when the persons stand side by side in a straight line, the outside place on the right, or the central place, is the first according to circumstances. When there are only two persons, the right hand is the first; if there are three, the middle place is the first, the right hand the second, the left hand the third. If the number is four, the furthest to the right is the first place, the next is the second, the left of the latter is the third, and then the fourth. Of five persons, the first is in the middle, immediately to the right is the second, to the left is the third, further to the right is the fourth, and the fifth is the furthest to the left. If six or more, the same principles are observed, according as the number is odd or even."

"In perpendicular order: i.e., when one comes after the other, the foremost place is sometimes the most honorable, sometimes the last, the next person who follows or precedes has the second, and so on. If there are only two, the front place is the first; if three, the midmost is the first, the second is in front, the third is behind. If four, the front place is the fourth, the next is the second, the next to that the first, the hindmost is the third. If five, the midmost is the first, the second is immediately in front, the third is behind, the foremost is the fourth and the hindmost is the fifth. If there are six or more, the same principle is observed according as the number of persons is even or odd."

In paragraph 388, the author says: "In a diplomatic house precedence is accorded to officials of rank belonging to the country, provided no Ambassadors are present. The latter yield precedence only to the minister for Foreign Affairs. On the other hand, in the house of an official or dignitary of the country, the diplomatists go before every one, except the minister for Foreign Affairs. In a diplomatic house the host gives precedence to his foreign colleagues over his own countrymen, no matter what the rank of the latter."

The author, in his chapters on "Counsels to Diplomatists" (advice to diplomats)[1] and "The Selection of Diplomatic Agents" makes the average American feel rather nervous. Starting with the minister for Foreign Affairs, he says: "Sometimes he is a diplomatist by training and profession, at others he is merely a political personage, who may or may not be possessed of special knowledge fitting him for the post. When we speak of the 'diplomacy' of a country as skilful or blundering, we do not mean the management of its international affairs by its agents residing abroad, but their direction by the statesman at the head of the department. Many writers and speakers are disposed to put the blame for a weak or unintelligent diplomacy on the agent, but this mistake arises from the ignorance of the organization of public business. The proper person to blame is the Secretary of State, or Minister for Foreign Affairs. Sometimes, in autocratic governments, the responsibility lies on the sovereign."

The author gives as the qualifications necessary for a diplomatic career at the present time, "good temper, good health, and good looks, rather more than the average intelligence, though brilliant genius is not necessary; a straightforward character devoid of selfish ambition; a mind trained by the study of the best literature and by that of history; capacity to judge of evidence. In short, the candidate must be an educated gentleman."

It would seem that the principal requisite for diplomats would be a certain amount of training, as that is a qualification for any other known profession. Big corporations do not employ amateurs as lawyers, as doctors, or as experts. Diplomacy, properly regarded, is the first line of the national defense. Experienced and trained diplomats lessen the chances of war by removing misunderstanding. To oppose trained diplomats with untrained is like, in war, opposing trained troops with untrained ones. It is unfortunate for the relations of this country with other countries that political custom sanctions the crude and unintelligent method of rewarding contributions to national campaign funds with a choice of diplomatic posts. In Great Britain the country gets off cheaper by handing out an Earldom or lesser honors, flattering to the pride of the individual and of no danger to national safety. With us the trained secretaries in the diplomatic service usually have to content themselves with being "rubber rings" for the successful business men to cut their teeth on at the beginning of their diplomatic careers, for, should they be appointed ministers, they would be expected to "resign" if a new party comes into power on March 4. This provincial and elementary custom of making our first line of defense the spoils of politics has, as a corollary the fact that most foreign governments send, as diplomatic representatives to Washington, members of their diplomatic corps who have American wives, thus indicating their despair of understanding our disregard of diplomatic complexities.

While it is true that our Diplomatic Corps is lamentably underpaid and that only people with private means can look forward to it as a career, the danger of increasing the pay is to make it more than ever a spoil of politics. If, to my own personal knowledge and experience of the unfitness of certain political appointees as our diplomatic representatives abroad, were added that of thousands of other Americans, the testimony would make a monument to the shame of such a reckless system. It is, of course, quite reasonable and proper to fill certain important diplomatic posts with distinguished citizens and statesmen familiar with the policies of the administration. This is done in many other countries, but to deliberately make diplomatic posts the rewards of party politics is what the American people seem to want and to tolerate. What makes it difficult to change this "political" system is the occasional brilliant success of the "voluntary" system.

The present Lord Balfour, as Mr. Balfour, in the House of Commons, March 19, 1918, said: "I think the British world perfectly understands the broad ends for which British diplomacy works. . . . What is not simple, what is not plain, what is not easy, is the actual day-by-day

carrying out of the negotiations by which these ends are to be attained. A Foreign Office and a Diplomatic Service are great instruments for preventing, as far as can be prevented, friction between States, which are, or which ought to be friendly. How is the task of peace-maker—because that is largely the task which falls to diplomatists, and to the Foreign Office, which controls diplomatists—to be pursued if you are to shout your grievances from the house-top whenever they occur? The only result is that you embitter public feeling, that the differences between the two States suddenly attain a magnitude they ought never to be allowed to approach, that the newspapers of the two countries agitate themselves, that the parliaments of the two countries have their passions set on fire, and great crises arise, which may end, *have* ended sometimes, in international catastrophes."

Lord Salisbury, in 1865, said of British diplomacy: "In our foreign policy what we have to do is simply perform our part with honor, to abstain from a meddling diplomacy, to uphold England's honor steadily and fearlessly, and always to be rather prone to let action go along with words than to let it lag behind them."

It would be well to remember the successes of diplomacy in the numerous cases in which an able and honest diplomacy has averted war, also the great constructive work done in regulating the ordinary intercourse of nations through postal, monetary, copyright, and other conventions, a work so solidly based that it has survived even "the ghastly cataclysm of the World War," the negotiations of arbitration treaties; and, in general, all the attempts to systematize international relations.

The most far-reaching of the changes in diplomacy has been the fundamental one of the old diplomacy's assumption that the interests of States are *inevitably* antagonistic and that certainly a neighboring State is always a potential enemy. In the new diplomacy, to the inter-dependence of States has been added a strong consciousness of their inter-dependence and of the existence of reciprocal duties as well as of exclusive rights.

In the olden days it was accepted as axiomatic that a prince should extend his dominions either by conquest or by marriage. Richard Henry Lee, the proposer of the Declaration of Independence, said: "Politics is the Science of Fraud and politicians are the professors of this Science." Under the old school of diplomacy the ends justified the means; the good of the State came before everything else; all governments had frequently to infringe on the rules of justice in support of their ends; dissimulation took the place of truth; and the interests of humanity had to give way to the interests of the reigning prince. "An ambassador (says Calliéres) is called an honorable spy; because one of his principal occupations is to discover the secrets of the court to which he is accredited, and he acquits himself ill of his task if he does not know how to make the payments necessary in order to win over those who will be able to give him information." (This is not quoted by the author.) Prior to our entry into the Great War, the Austrian and German Ambassadors in Washington were

given their passports for conspiring against the United States Government.

Among the many vexing questions of precedence has been that of the military and naval attachés in our own legations and embassies. In England, and some other countries, they are presented to, and take their leave of the sovereign, and, in Germany before the Republic, like a Minister, they could not enter on their duties until received by the Emperor and they also personally took their leave on recall. A Charge d'Affairs, on the other hand, is only accredited to the Foreign Office.

The attitude of the United States, as regards the right of political asylum in legations, has been very conservative in theory, as pointed out by the author but, as a matter of fact, has rather strained it to the limit in practice. There is, throughout these two volumes, a high standard of conduct and a high conception of diplomacy, but the historical incidents and practical suggestions leave on the mind an "atmosphere" of cynicism and human fraility. The need of official couriers on account of ordinary mails not being safe, the general use of secret funds, and the growing tendency toward "dollar diplomacy" are corroding elements. The author says: "Many governments expect diplomatic agents to further the private commercial interests of their individual countrymen, and to endeavor to obtain for them the concession of valuable contracts. It is highly doubtful whether such intervention is, in the long run, beneficial to the higher interests of the state they represent." It is generally recognized that the interests of nations cannot be segregated, and, therefore, diplomacy should study to reconcile interests which are, or seem to be, in conflict, and so to preserve the peace which is the common interest of all. In olden times wars were fought by small professional armies, without hate, in accordance with recognized rules, and were ended by treaties in which all the forms of politeness were scrupulously observed and complete oblivion of the past and eternal friendship in the future were provided. Wars are now fought to death between whole populations because of irreconcilable interests and ideals. The prohibitive cost of war, like the prohibitive cost of litigation, tends to encourage settlements out of court by arbitration.

The principles of diplomacy have their source in international law which is, in itself, the sum of the rules admitted, recognized and consecrated by custom or by convention, rules which determine the rights and duties of States in peace or war. In the absence of an international legislature competent to lay down new rules to meet new circumstances, and of an international police force to compel their acceptance, the task of peacefully adjusting international differences falls upon diplomacy, making the differences political instead of military—war being the last word. This author says that "The moral qualities of statesmen and nations have not kept pace with the development of the means of action at their disposal." The question of principles and the qualifications of officials are of more vital importance now than ever before, "since modern means of rapid inter-communication demand an immediate and often a hasty decision on matters of vital importance."

The modern diplomatic system with its elaborate organization and international code of rules is the result of the international conflicts, controversies and accumulations of the ages. A diplomat may properly be regarded as an advocate who must try always to make out as strong a case as possible for his side, and, in doing so, has the same liberty as an attorney in a court of law in presenting the facts "in lights favorable to his own case." As one writer says: "It is clear, moreover, that a thorough knowledge of technicalities and customary forms is as necessary for a diplomatist as for a lawyer. These forms have been elaborated by a long process, the observance of which prevent causes of offense which formerly led to war. They may be circumlocutory and non-committal, but they regulate the precise words of respect and courtesy necessary to make use of on every occasion; they deprive argument of its heat and expostulation of its acrimony."

In the long run the interests of a statesman of any nation are bound up with those of the whole community and nation to which he belongs, and if he pursues a purely selfish policy, sooner or later this will end in disaster.

ROBERT FULTON AND THE SUBMARINE, by Wm. Barclay Parsons. Columbia University Press. $2.50.

A Review by Comdr. J. O. Fisher, U. S. Navy

In a letter dated September 20, 1801, Fulton regrets that he had not earlier knowledge of the "Consul's desire to see the plunging boat. When I finished my experiments, she leaked very much, and being but an imperfect engine, I did not think her further useful, hence I took her to pieces."

If Napoleon had seen the plunging boat which Fulton constructed and with which he blew to atoms a small sloop of forty feet in length, at Brest in 1801, would he have been convinced of its efficiency as a weapon for war at sea? More particularly would he have been convinced that Fulton was not a swindler and charlatan and would he have developed the submarine as a weapon for use in war against the sea power of Britain?—a development and use which constituted the most effective challenge ever made to sea power measured in terms of ships and guns.

Information regarding Fulton's activities in France was sent out in a secret circular from the British Admiralty's Office in London on June 19, 1803, and addressed to all the commanders-in-chief as follows:

> Mr. Fulton, an American resident at Paris, has constructed a vessel in which he has gone down to the bottom of the water, and has remained thereunder for the space of seven hours, at one time—that he has navigated the said vessel, under water at the rate of two miles and a half per hour; that the said submarine vessel is uncommonly manageable and that the whole plan to be effective by means thereof, may be easily executed and without much risk; that the ships and vessels in the port of London are liable to be destroyed with ease, and that the channel to the River Thames

may be ruined; and that it has been proved that only twenty-five pounds of weight gunpowder was sufficient to have dashed a vessel to pieces off Brest, though externally applied.

On October 15, 1805, after Fulton had been in England about two years in response to Pitt's invitation and support, he repeated the performance recited in the secret circular, quoted above, by blowing up a brig called the *Dorothea* in Walmer Roads in the presence of Pitt and other officials. However, six days later, on October 21, 1805, Nelson destroyed the combined French and Spanish Fleets in the battle of Trafalgar, and England had no need of submarines, torpedoes or of Fulton. Pitt's wisdom in controlling the man who possessed the secret of submarine navigation and the use of submarine mines had accomplished its purpose.

During the World War there were not more than eleven submarines operating at sea against transport and cargo shipping at any one time and the average number so operating was materially less. They destroyed approximately thirteen million tons of shipping, in addition to their cargoes. In effecting this enormous destruction of the material resources of War, only *fifteen thousand* lives were destroyed as compared to millions killed and wounded in the war. The crews of the submarines performed arduous and nerve-racking duty under the most dangerous conditions existing in the armed forces engaged. If a maximum destruction of material resources with a minimum destruction of life is a measure of humane methods of conducting war on the sea, the submarine is the most efficient and humane weapon of sea power so far developed.

There are certain details in Fulton's design of his first submarine which remind one of Dr. David Bushnell and his "American Turtle" during our Revolutionary War, when Bushnell succeeded in attaching and exploding a bomb on the British vessell, the *Eagle* in lower New York Harbor, inflicting considerable damage.

David Bushnell was in France, at Paris, attempting to interest the Directory in a submarine when Fulton first appeared on the scene in 1797. It is very probable that Bushnell and Fulton were acquainted, which would account for the similarity of ideas mentioned above.

When Fulton left England in 1806 to return to the United States, he left a complete set of drawings and descriptions of his whole system of submarine attack in a tin cylinder, sealed, in the care of General Lyman, not to be opened unless he was lost. General Lyman had been appointed American Consul in London in 1805. These plans and descriptions were apparently misplaced and made no appearance of record until 1870 when they were sold at auction. Then for a period of fifty years they rested quietly and unknown to the general public in the family of the purchaser, a Mr. Andrews, of Swarland Hall, Felton, Northumberland. In 1920 they once more changed ownership and came into the possession of the author, by whom, after a lapse of 116 years, they are published in accordance with Fulton's wish expressed to his dearest friend, Joel Barlow, as follows:

I have left you the means to publish these works with engravings in a

handsome manner, and to which you will add your own ideas—showing how the liberty of the seas may be gained by such means.

The detail of Fulton's study of the submarine as indicated by the drawings and descriptions reproduced in this volume and his understanding of the principles governing its operation under water, and more particularly, his prophetic elucidation of its effective use in war is extraordinary even to a man professionally interested in the subject.

The submarine has achieved a position in the front rank of weapons for making war at sea. To any person desirous of becoming acquainted with submarine navigation and general principles of submarine warfare, this book is heartily recommended.

THE UNITED STATES, FROM THE DISCOVERY OF THE AMERICAN CONTINENT TO THE END OF THE WORLD WAR, by William Henry Hudson and Irwin S. Guernsey. Frederick A. Stokes Company, New York. $5.00.

This volume of over six hundred pages is one of the *Great Nations Series,* of which the purpose, as the prospectus informs us, is "to present history in such a way that the reader will understand the underlying soul of each country discussed." The volume on the United States was begun by the late Professor William Henry Hudson, an Englishman by birth and at the time of his death attached to the University of London; he had, however, spent many years in the United States, when he was for some time a lecturer at Leland Stanford University and the University of Chicago. Unfortunately, death cut short Professor Hudson's work when the story had progressed no further than the close of John Adams's administration, and the volume was completed by Mr. Guernsey, an instructor in history in a New York City High School. The reader will notice a distinct change in method and style at the point mentioned.

It is no disparagement of Mr. Guernsey's writing to say that it falls far short of that of his collaborator. Professor Hudson writes with unusual distinction, whether one appraise his work as history or as literature. It is evident at once that he has taken no ready-made or second-hand views of the period of which he writes; he has, on the other hand, thoroughly steeped himself in the contemporary literature of the colonial and early national periods, and writes with a fluency and ease which can spring only from that sort of first hand knowledge. In reading a history of the United States by an Englishman, one naturally turns with curiosity to the treatment of the period between 1763-83. It is hard to see how any American reader can find fault with Professor Hudson's presentation of that period. There is of course no rabid denunciation of the crimes of Britain, but the point of view of the colonists is presented fairly and sympathetically, and the writer quotes with approval Professor Howard's statement that: "The arrogance and blind indifference with which the

sentiments and petitions of the colonists were treated during the enactment of this fatal measure [the Stamp Act] place the responsibility for the American Revolution squarely on the shoulders of the British Government." That is strong enough, coming from an Englishman. For conciseness and accuracy combined with a charming style, the account of discovery, colonization, colonial life, and the struggle for independence leaves little to be desired. One feels that the author has done much to reveal "the underlying soul" of early America.

Mr. Guernsey's work, which makes up more than half the book, is of a different order. It is full, painstaking, and generally accurate, but plodding and uninspired. On the whole, it is a good brief account of the surface facts of our national life from 1801 to 1920, but the reader who glances at the footnotes observes that the citations, instead of referring to source material, now refer almost exclusively to the briefer secondary works, and there is a corresponding decline in authoritativeness, originality, and distinction. Upon some points the author has not made use of important bits of information that should have been familiar to him. This is particularly true when he comes to the diplomacy of the last days preceding the war with Spain and the negotiations that led President Roosevelt to intervene in the Russo-Japanese War.

On the whole, however, it is surprising to see how many facts, generally told with accuracy, Mr. Guernsey has condensed into a small space and in a fairly readable form. He has not, like Professor Hudson, given us "the underlying soul" of the America of his period; but then we are not aware that any one has caught, or even satisfactorily defined, the soul of our post-Civil War United States. We can only regret that Professor Hudson was not given a try at it.

Meanwhile, this volume is one that every student of United States History should be glad to have on his shelves.

J. W. P.

MARINE ENGINES, by A. Ritchie Leask. Lately from the press of Simpkins, Marshall and Company, Ltd. A volume devoted to steam marine machinery, and embodies practices prevalent in the British Merchant Marine with some reference to the British Naval service. $7.50.

The author has very interestingly traced the development of the steam engine from the times of Savery, Newcomen and Watt to the present time, and has shown the value of each important development in such a manner as to leave no doubt in the mind of the reader as to what was sought and what was accomplished.

One chapter has been devoted to each of the following:

Heat and Temperature
Reciprocating Engines

Marine Turbines
Geared Turbines
Comparative Efficiency of Turbines and Reciprocating Engines
Condensers
Auxiliary Pumps
Feed Heaters and Evaporators
Friction
Lubrication
Slide Valves
Indicator Diagrams
Torsion Meters
Propellers
Corrosion
Reversing Rudders

The book has been written for the practical marine engineer. The language is simple, and the explanations should be easily understood by any one. Throughout the book the author has tried to show the practical methods of obtaining economy, without losing sight of the theoretical considerations involved. The text is replete with practical problems and examples, which are worked out and explained in a very convincing manner.

The author assumes that the reader has a general knowledge of the various parts of the marine engine and with this in view has omitted a great many of the details that are often discussed in a work of this kind.

The style is decidedly British. English units are used throughout.

The chapter devoted to comparing the efficiency of the turbine with that of the reciprocating engine deserves more than passing notice. This chapter is more or less a rebuke to the exponents of the marine turbine, and the author cites a number of actual tests to uphold his contentions. While the reader may not agree entirely with the author, there is much food for thought in what he has to say on this subject.

G. B.

MARINE WORKS, by Ernest Latham. Crosby Lockwood and Son, London, England. $5.00.

This book, recently from the press of Crosby Lockwood and Son of London, is designated by the author as a practical treatise for maritime engineers, landowners, and public authorities. However, the material more especially concerns the consulting and the civil engineer having problems dealing with waterways and coastal projects.

The treatise is a compilation of papers reprinted from various articles appearing in such engineering publications as: *Engineering, Contract Journal,* and others. This method has, in some instances, caused some repetition of the subject matter but on the other hand, has the advantage of having been tried out.

Some of the subjects covered are: waves, salvage of maritime works, maintenance of tidal berths, pile driving, conservancy of marsh lands, coast defense, structural problems on navigable rivers, scour, deep-water quays and legal aspects of maritime engineering.

A portion of the chapter on the conservancy of marsh lands is devoted to tidal hydro-electric problems as applied to riparian marsh lands. Similar problems would be encountered elsewhere so that the treatment brings out many interesting facts as well as some of the limitations of this method as a source of power.

The illustrations, both line and photographic, are numerous and are a material aid in the clarification of the text. The consulting engineer will also find the tables and cost data useful. It is perhaps unfortunate that the author has not given some itemized cost data in addition to the job total costs.

The author's style is as plainly British as are his book problems. He has confined all of his work within the boundaries of Great Britain. However, he has broadened the scope of his work by being generous with his references.

C. P. B.

ELEMENTS OF RADIO COMMUNICATION, by Ellery W. Stone. D. Van Nostrand Co. New York. 1923. $2.50.

Although the title of the book is new, it is in fact a second edition of *Elements of Radiotelegraphy* originally published in September, 1919, "for the guidance and instruction of radio students in the Communication Service of the Navy." The original text was, in the main, a résumé of a series of lectures given to the radio classes at the U. S. Naval Radio Station, San Diego. The author states that the new edition has been thoroughly revised. In particular the treatment of vacuum tubes and their applications has been extended.

After an introductory chapter giving a concise review of elementary electricity, the book follows out the theory and development of radio transmitting apparatus, presenting the various transmitting circuits in their historical order. This development includes an unusually comprehensive treatment of damped wave transmitters. Receiving circuits up to but not including vacuum tube apparatus are similarly but more briefly treated in chapter ten. Chapters eleven and twelve are devoted mainly to vacuum tubes, the appartus used with them, and their applications. Super-regeneration is explained and typical circuits showing its application are given. The book closes with a brief discussion of radiophone broadcasting and predictions for the future.

The book is relatively free from errors, although a couple of fairly obvious ones (such as the misplacing of the winding in the Baldwin phone, fig. 121) appear to have escaped detection. An outstanding point in the book is the treatment of resonance and its application to radio circuits.

G. D. R.

SECRETARY'S NOTES

Membership

Present membership, 4638. Changes since January 1, 1923: New members, 183. Resignations, 71. Deaths, 18. Total increase, 94.

Subscription Rates

In order to bring the subscription rate more nearly in line with the cost of publication, the Board of Control has increased the subscription rate to $5.00 per year. A special rate of $3.50 per year is made to members only (not available to societies or organizations) in order that they may send subscriptions for the PROCEEDINGS to their relatives and friends. (Foreign postage 50 cents extra in all cases). Subscriptions are automatically discontinued at expiration.

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Foreign Postage

For a number of years members residing abroad have been paying fifty cents extra per year for foreign postage, which does not quite cover the additional cost to the Institute at the present time. Life members residing abroad have not heretofore made this payment. The Board of Control has decided that all classes of membership shall be treated on the same basis, and life members residing abroad will, therefore, be required to pay fifty cents per year for foreign postage, effective 1 January 1924.

Articles

The Institute desires articles of interest to all branches of the service, including the reserve force. Non-members as well as members may submit articles, and authors receive due compensation for articles published. Compact, well digested articles are more likely to be accepted for early publication. In accepting articles for publication, the Institute reserves the right to have such articles revised or rearranged, where necessary, in order to bring them up to the required standard of articles published in the PROCEEDINGS—the cost, if any, to be deducted from the compensation due the author.

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To insure the delivery of the PROCEEDINGS and other communications from the U. S. Naval Institute, it is essential that members and subscribers *notify the Secretary and Treasurer of every change of address without delay.* No responsibility can be accepted for failure to receive the PROCEEDINGS, where members fail to comply with this rule.

H. G. S. WALLACE,
Commander, U. S. Navy, Secretary and Treasurer.

SPECIAL NOTICE

Naval Institute Prize, 1924

A prize of two hundred dollars, with a gold medal and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best original article on any subject pertaining to the naval profession published in the Proceedings during the current year. The prize will be in addition to the author's compensation paid upon publication of the article.

On the following page are given suggested topics. Articles are not limited to these topics and no additional weight will be given an article in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All original articles published in the Proceedings during 1923 shall be eligible for consideration for the prize.

2. No article received after October 1 will be available for publication in 1923. Articles received subsequent to October 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best article published during 1923 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more articles receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. The method adopted by the Board of Control in selecting the Prize Essay is as follows:

(a) Prior to the January meeting of the Board of Control each member will submit to the Secretary and Treasurer a list of the articles published during the year which, in the opinion of that member, are worthy of consideration for prize. From this a summarized list will be prepared giving titles, names of authors, and a number of original lists on which each article appeared.

(b) At the January meeting of the Board of Control this summary will, by discussion, be narrowed down to a second list of not more than ten articles.

(c) Prior to the February meeting of the Board of Control, each member will submit his choice of five articles from the list of ten. These will be summarized as before.

(d) At the February meeting of the Board of Control this final summary will be considered. The Board will then decide by vote which articles shall finally be considered for prize and shall then proceed to determine the relative order of merit.

6. It is requested that all articles submitted be typewritten and in duplicate; articles submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

H. G. S. WALLACE,
Commander, U. S. Navy, Secretary and Treasurer.

SUGGESTED TOPICS FOR ARTICLES

Aviation—Its Present Status and Probable Influence on Strategy and Tactics.
The Anti-Aircraft Problem from the Navy's Viewpoint.
Co-ordination of the Naval Air Force with Other Naval Forces.
Naval Bases, Their Number, Location, and Equipment.
Military Character.
The Relation of Naval Communication to Naval Strategy.
Proportion of National Budget Which Should be Devoted to Naval Expenditures.
The Necessity for Having a Fleet.
Organization of Fleet for War.
The Offensive and Defensive in Gas Warfare.
The Best Protection from Gas Attack.
Naval Gunnery of Today, the Problems of Long Range and Indirect Fire.
Physical Factors in Efficiency.
The Relation between the Navy and the Merchant Marine.
America as a Maritime Nation.
Relation of the Medical Department to a Plans Division.
The Place of Mines in Future Naval Warfare.
A Mobilization Program for the Future.
Morale Building.
The Mission of the Naval Academy in the Molding of Character.
How to Best Educate and Convert the American People to the Need of a Strong National Defense.
The Navy in Battle; Operations of Air, Surface, and Underwater Craft.
Navy Spirit—Its Value to the Service and to the Country.
Based on a Major Ship Strength of Eighteen Dreadnaughts, What Do You Consider a Balanced Navy?
The Future of the Naval Officers' Profession.
The Naval Officer as a Diplomat.
Is the Present System of Training and Education for Officers Satisfactory and Sufficient?
The Rôle of the Navy at Peace.
Training Naval Personnel During the Next Ten Years.
Six Years of Promotion by Selection in U. S. Navy. Its Effect Upon Discipline and Morale.
The Employment of Retired Officers Separated from the Service by Reason of the Age in Grade Feature of the Existing Selection Law.
What Measures Should be Adopted to Create and Maintain a Balanced Enlisted Personnel of 120,000 Men?
Our Future Naval Policy Based on Existing International Treaties.
The Future Naval Continental Shore Establishments.
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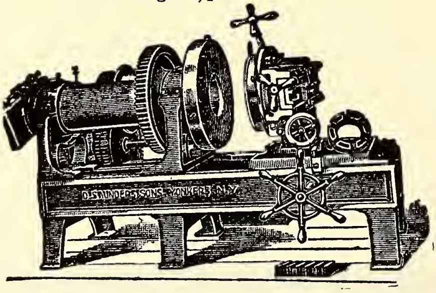

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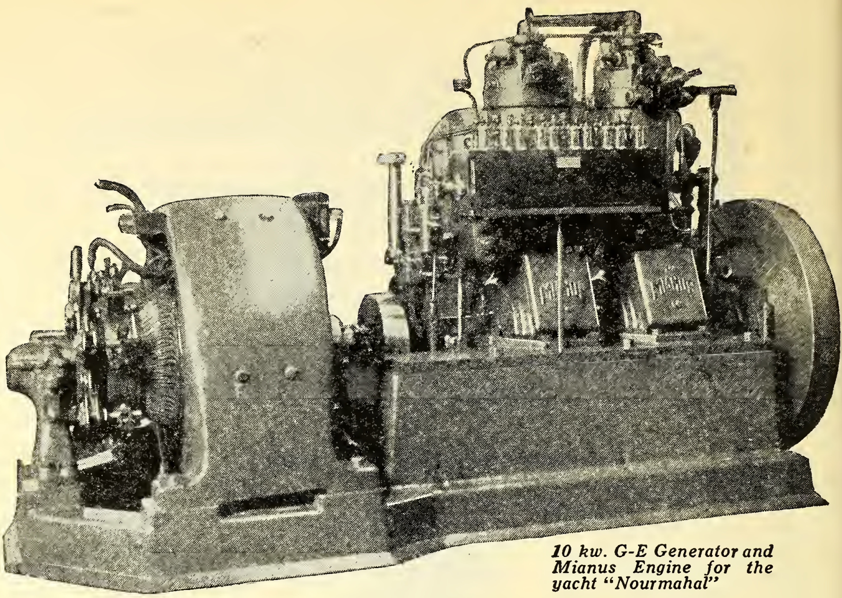

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